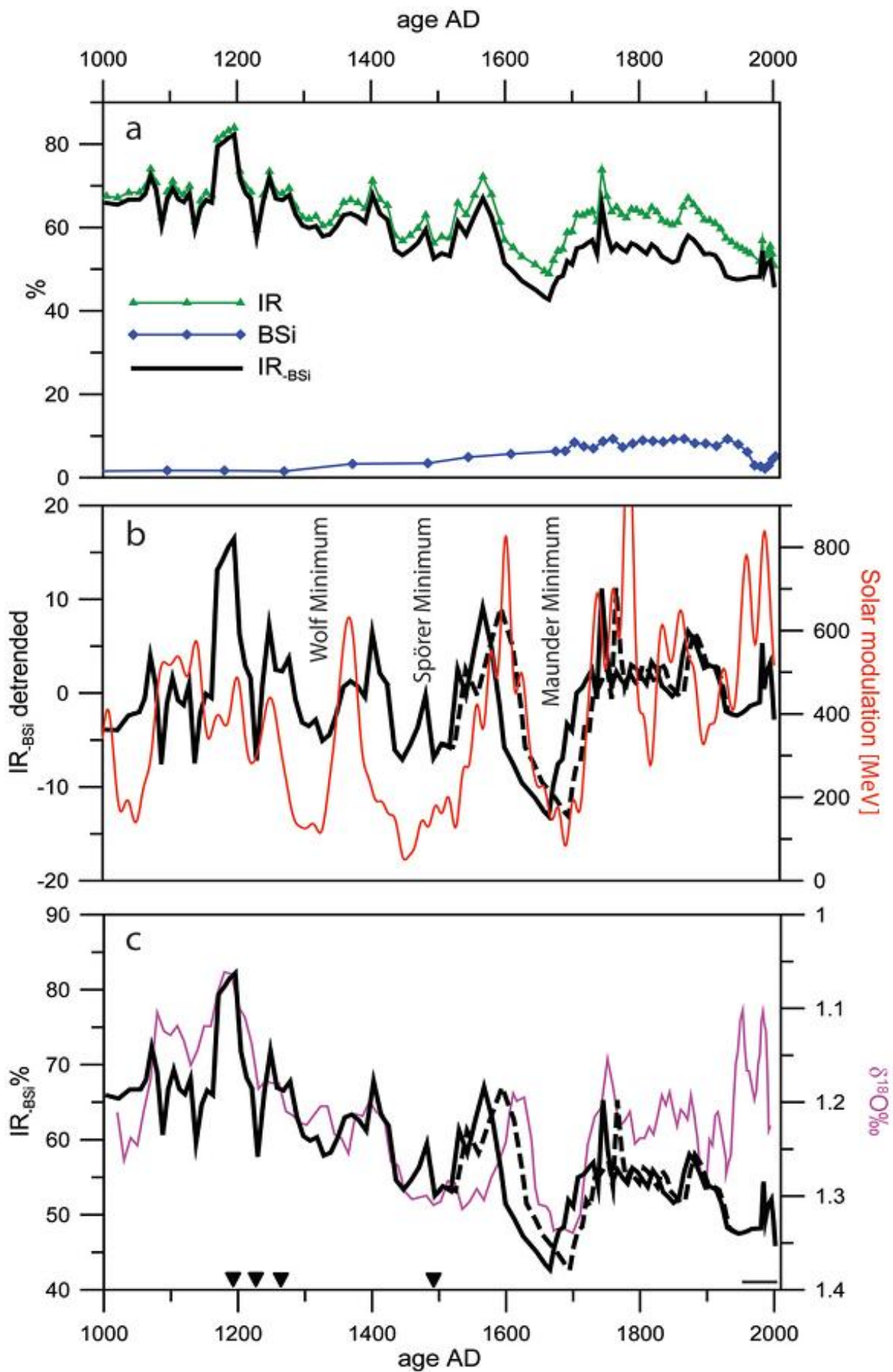


Neue Studie zeigt: Klima reagiert auf kurz- und langzeitliche Änderungen der Sonnenaktivität

geschrieben von Anthony Watts | 6. Januar 2013



IRBSi ist die Proxy für Niederschlag/Klimaänderung und zeigt eine gute Übereinstimmung mit der Sonnenaktivität. Der Vergleich zwischen den

Graphen der **IR-BS** und der Sonnenzyklen zeigt eine gute Übereinstimmung zwischen dem Prozentsatz mineralischer bodenfremder Materialien und Sonnenzyklen, rekonstruiert auf Basis von Änderungen der C14-Konzentrationen in Makrofossilien. Eine gute Übereinstimmung zeigt sich auch zwischen der Konzentration von O18 in Mikroorganismen in der Norwegischen See und dem Index **IR-BSi**.

Solarer Antrieb des Klimas während des letzten Jahrtausends aus See-Sedimenten in Nordschweden

[Original: Solar forcing of climate during the last millennium recorded in lake sediments from northern Sweden]

U Kokfelt University of Copenhagen, Denmark

R Muscheler Lund University, Sweden

Abstract

Wir berichten von einer Aufzeichnung in Sedimenten eines kleinen Sees in dem subarktischen Feuchtgebiet Stordalen im nördlichsten Schweden, die die letzten 1000 Jahre abdeckt. Es stellte sich heraus, dass Variationen im Gehalt anorganischer Materialien den rekonstruierten Variationen der Sonne zwischen dem 13. und dem 18 Jahrhundert folgten. Perioden mit geringer Sonnenaktivität sind verbunden mit Minima im anorganischen Material und umgekehrt. Ein Vergleich zwischen den Sonnenfleckenzyklen und einer

langen Messreihe sommerlicher Niederschläge zeigt eine weitere Beziehung zwischen dem 11-jährigen Sonnenzyklus und der Variabilität sommerlicher Niederschläge seit etwa 1960. Solare Minima stehen während dieser Periode in Zusammenhang mit Minima sommerlicher Niederschläge, während die sommerliche Niederschlagsmenge in Perioden mit höherer Sonnenaktivität zunimmt. Unsere Ergebnisse zeigen, dass das Klima sowohl auf die 11-jährigen als auch auf langzeitliche Änderungen der Sonnenaktivität und besonders deren Minima reagiert, was zu trockenen Bedingungen mit entsprechend geringerem Abfluss führt.

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Man erinnere sich, dass eine im vorigen Jahr veröffentlichte Studie im Journal *Astronomy & Astrophysics*

zeigt, dass sich die Sonnenaktivität zum Ende des 20. Jahrhunderts nahe den höchsten Niveaus der vergangenen 11500 Jahre befunden hatte.

Die von einem Forscher am Max-Planck-Institute in *Astronomy & Astrophysics* veröffentlichte Studie rekonstruiert die Sonnenaktivität während des Holozäns und zeigt, dass sich die Sonnenaktivität zum Ende des 20. Jahrhunderts nahe den höchsten Niveaus der vergangenen 11500 Jahre befunden hatte. Die Rekonstruktion erstreckt sich über die letzten 2500 Jahre, und die Studie zeigt einen ‚Hockeyschläger‘ der Sonnenaktivität nach dem Ende der kleinen Eiszeit im 19. Jahrhundert.

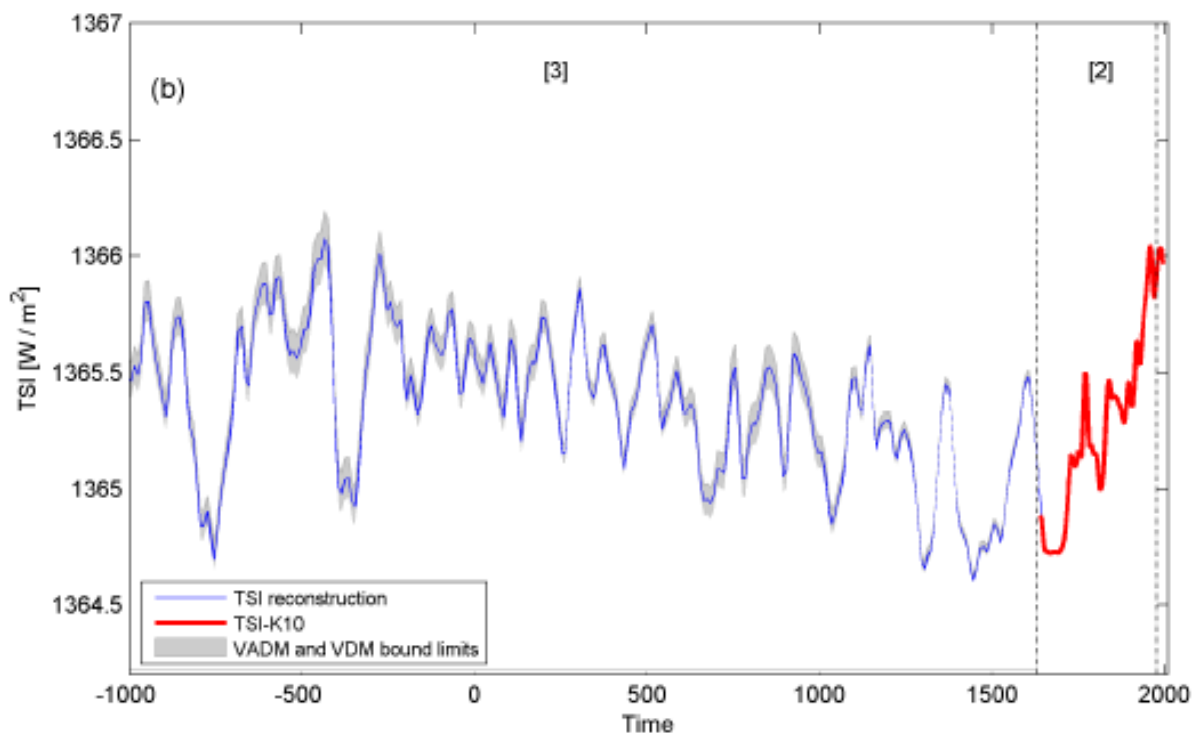
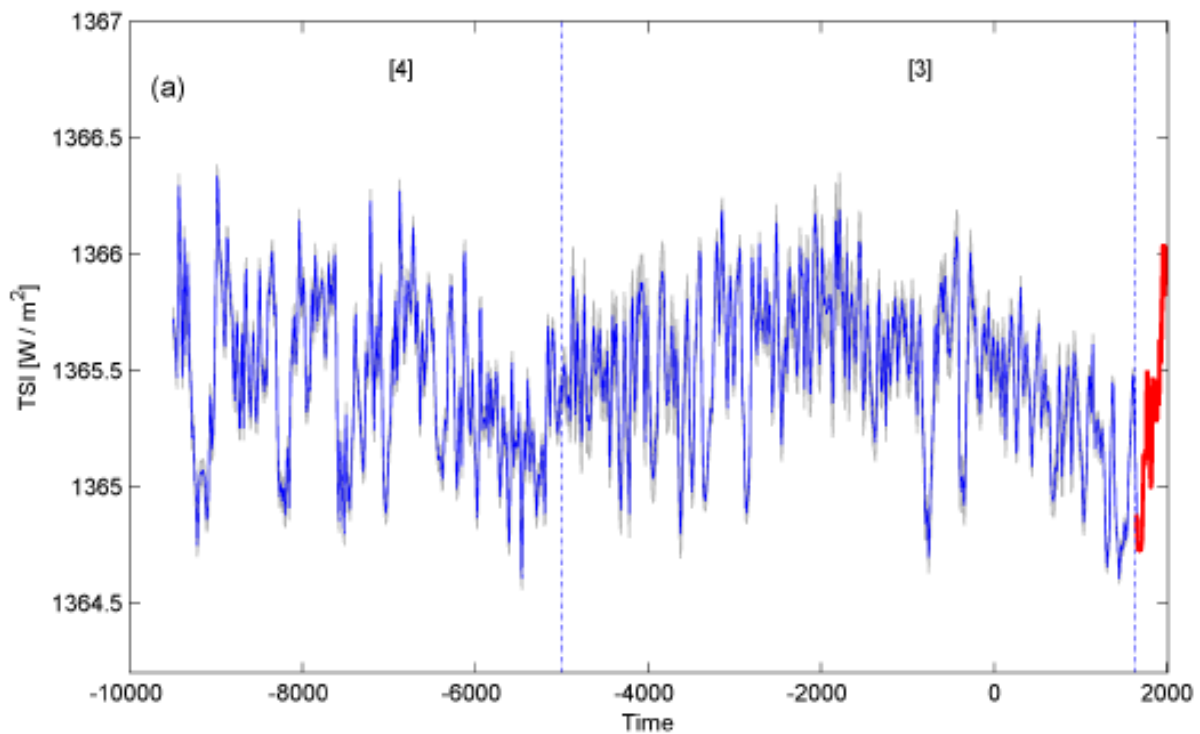


Bild 2: Nach der TSI gewichtete Rekonstruktion seit etwa 9500 vor Christus. Zur Verdeutlichung ist die

Entwicklung seit 1000 vor Christus in Karte (b) dargestellt. Das graue Band repräsentiert das Gebiet, das von den KN08-VADM und KC05-VDM-Rekonstruktionen begrenzt wird. Als Referenz repräsentiert die rote Linie die 10-jährig gemittelte Rekonstruktion von Krivova et al. (2010a).

Die Entwicklung der Solarstrahlung während des Holozäns

[Original: Evolution of the solar irradiance during the Holocene]

L. E. A. Vieira^{1,2}, S. K.

Solanki^{1,3}, N. A. Krivova¹ and I. Usoskin⁴

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Sonnensystemforschung, Max-Planck-
Str. 2, 37191 Katlenburg-Lindau,
Germany

Laboratoire de Physique et Chimie de
l'Environnement et de l'Espace
(LPC2E/CNRS), 3A, Avenue de la

Recherche, 45071 Orléans Cedex 2,
France

School of Space Research, Kyung Hee
University, Yongin, Gyeonggi,
446-701, Korea

Sodankylä Geophysical Observatory
(Oulu Unit), POB 3000, University of
Oulu, Finland

Abstract

Zusammenhang:

Langzeitliche

Aufzeichnungen des

solaren

Strahlungs-Outputs

sind zum

**Verständnis der
solaren
Variabilität und
des Klimas in der
Vergangenheit
unabdingbar.
Messungen der
Solarstrahlung
stehen jedoch nur
aus den letzten
drei Jahrzehnten
zur Verfügung, was**

**nach
Rekonstruktionen
dieser
Größenordnungen
ruft mit Hilfe von
geeigneten
Modellen über
längere Perioden.**

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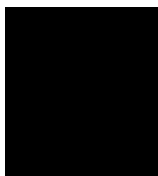
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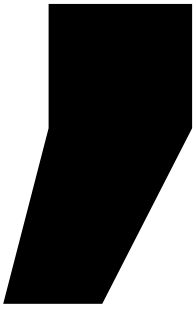
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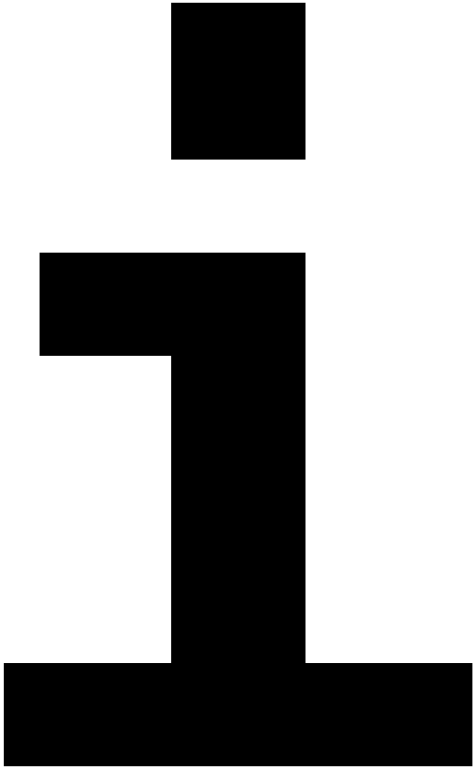
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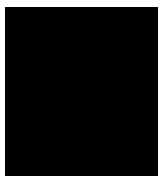
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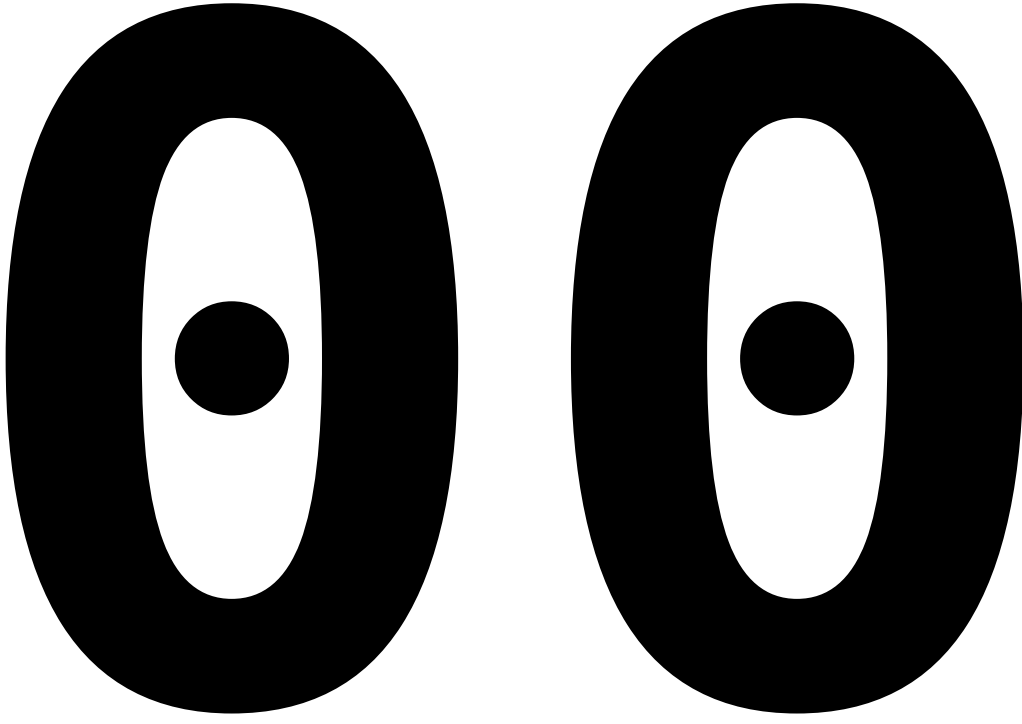
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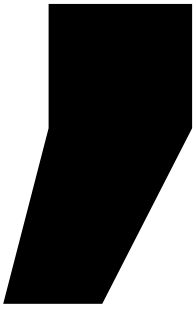
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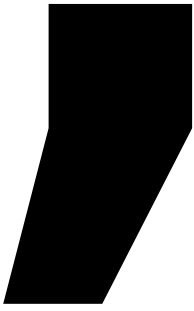
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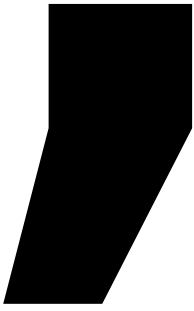
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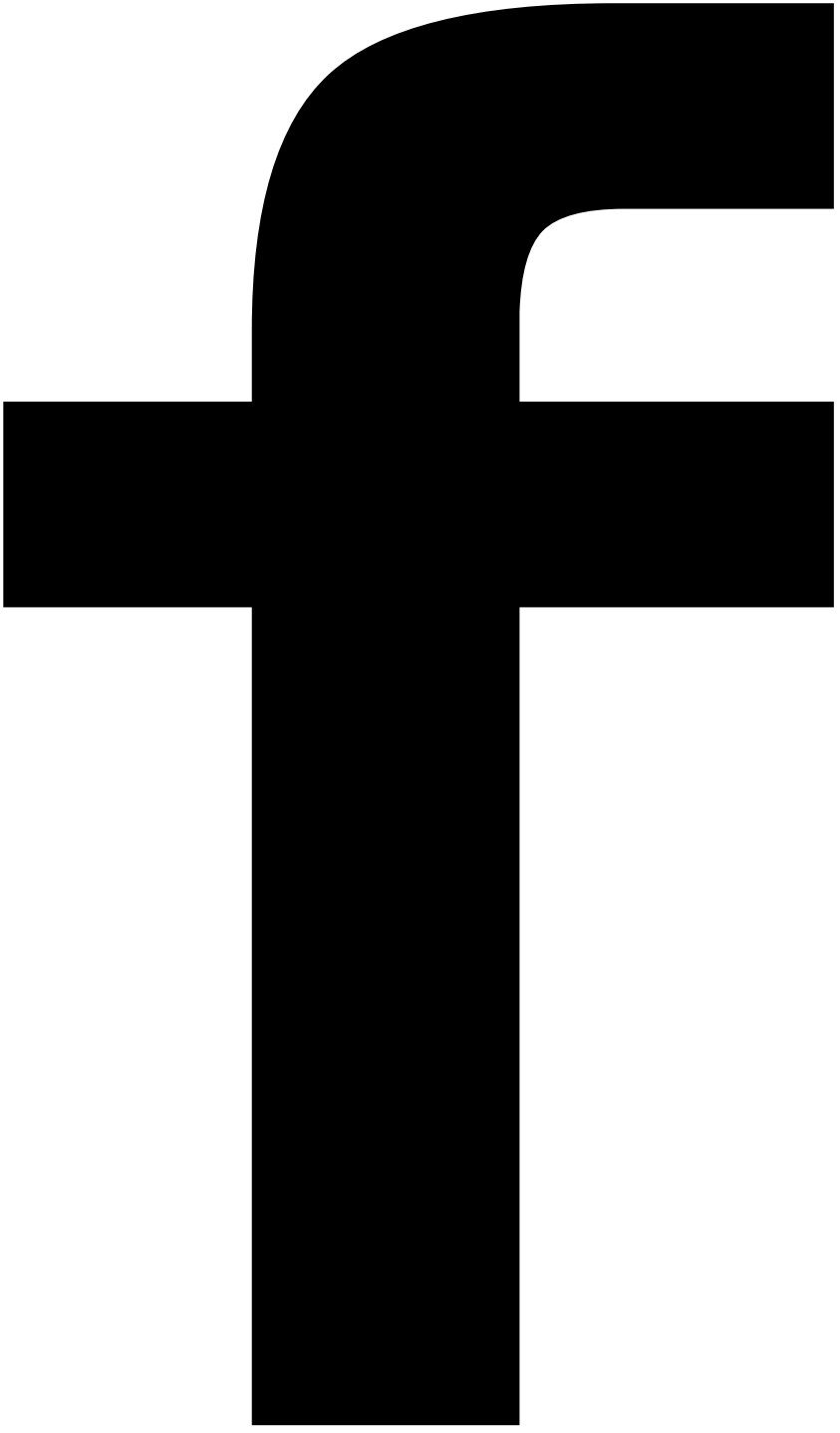
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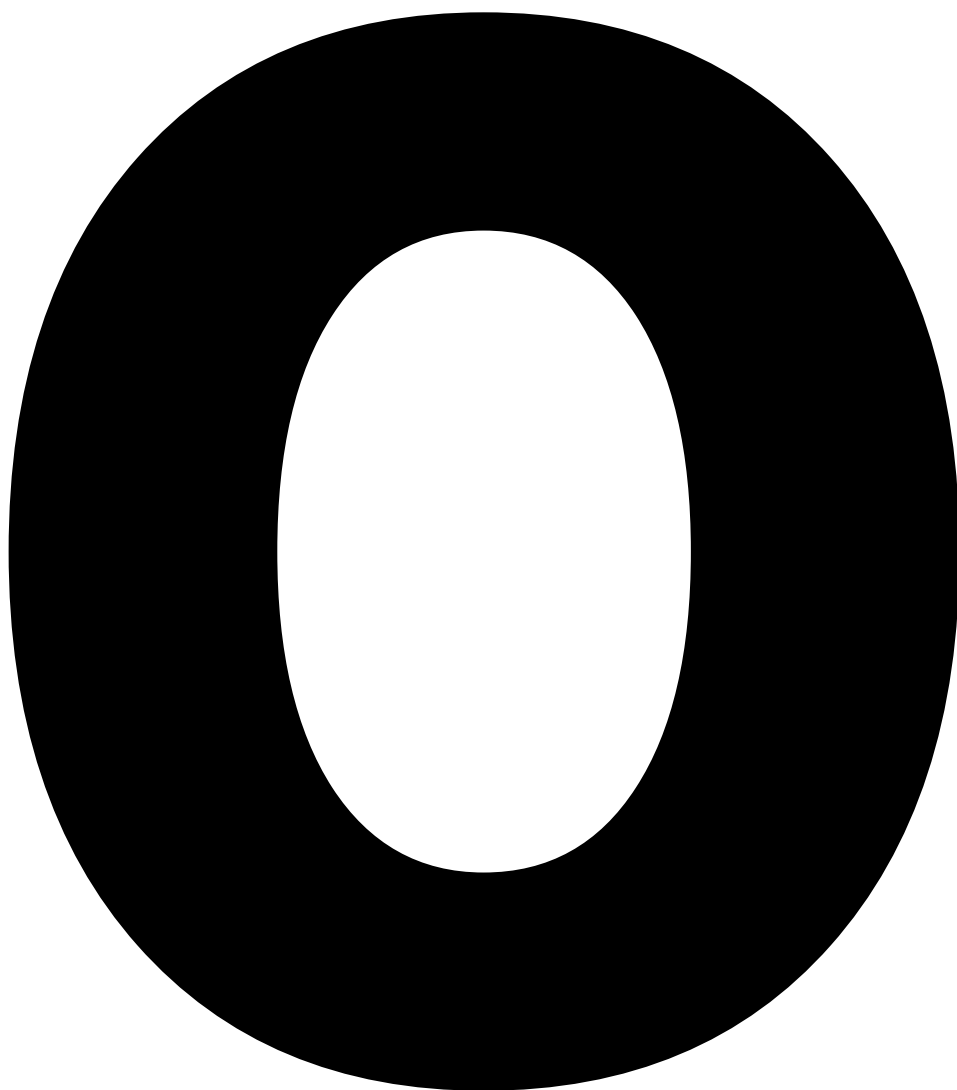
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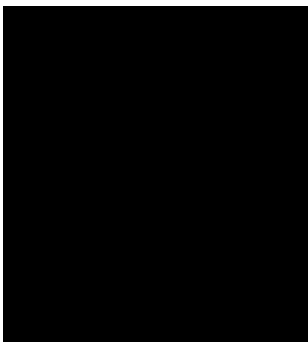
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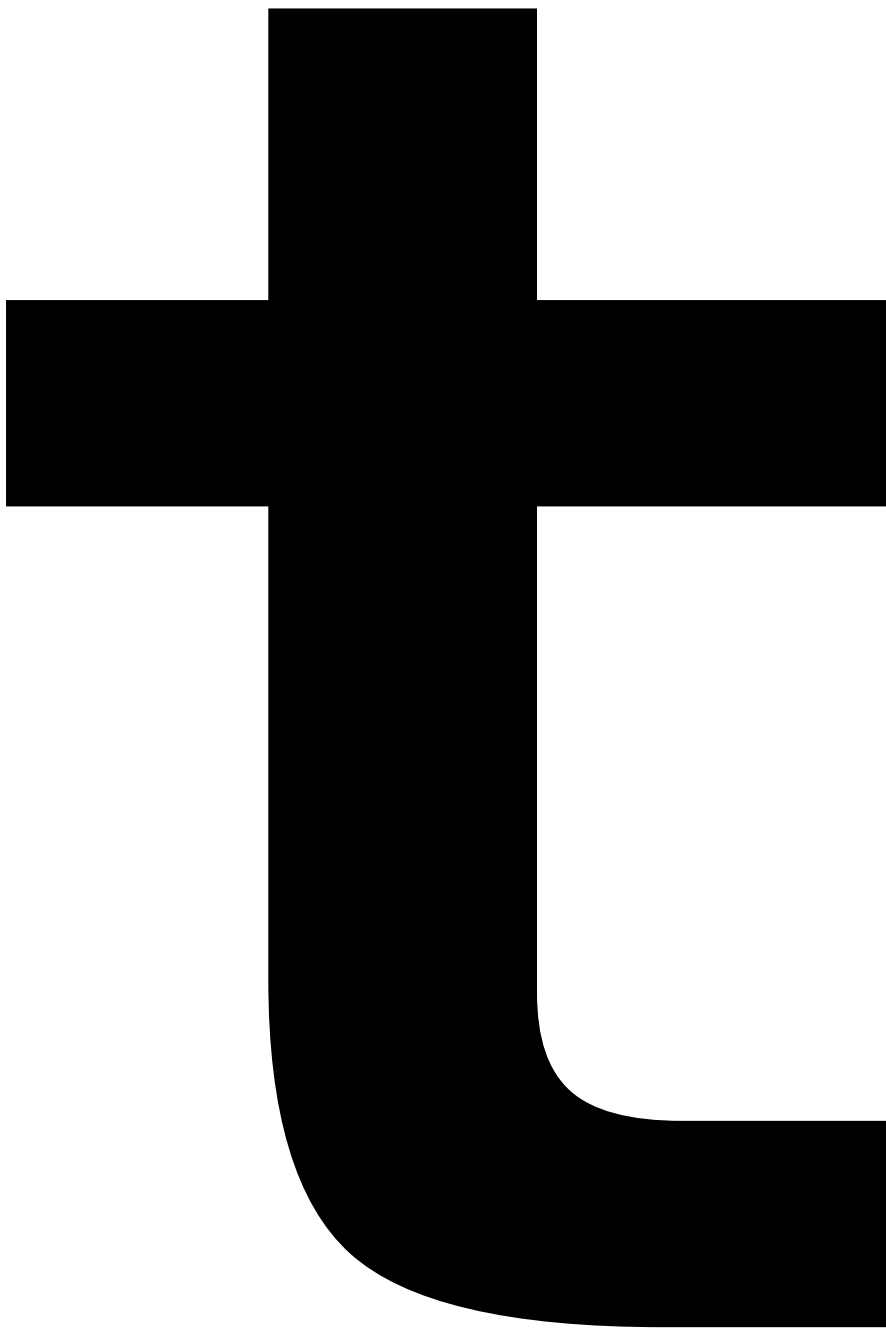


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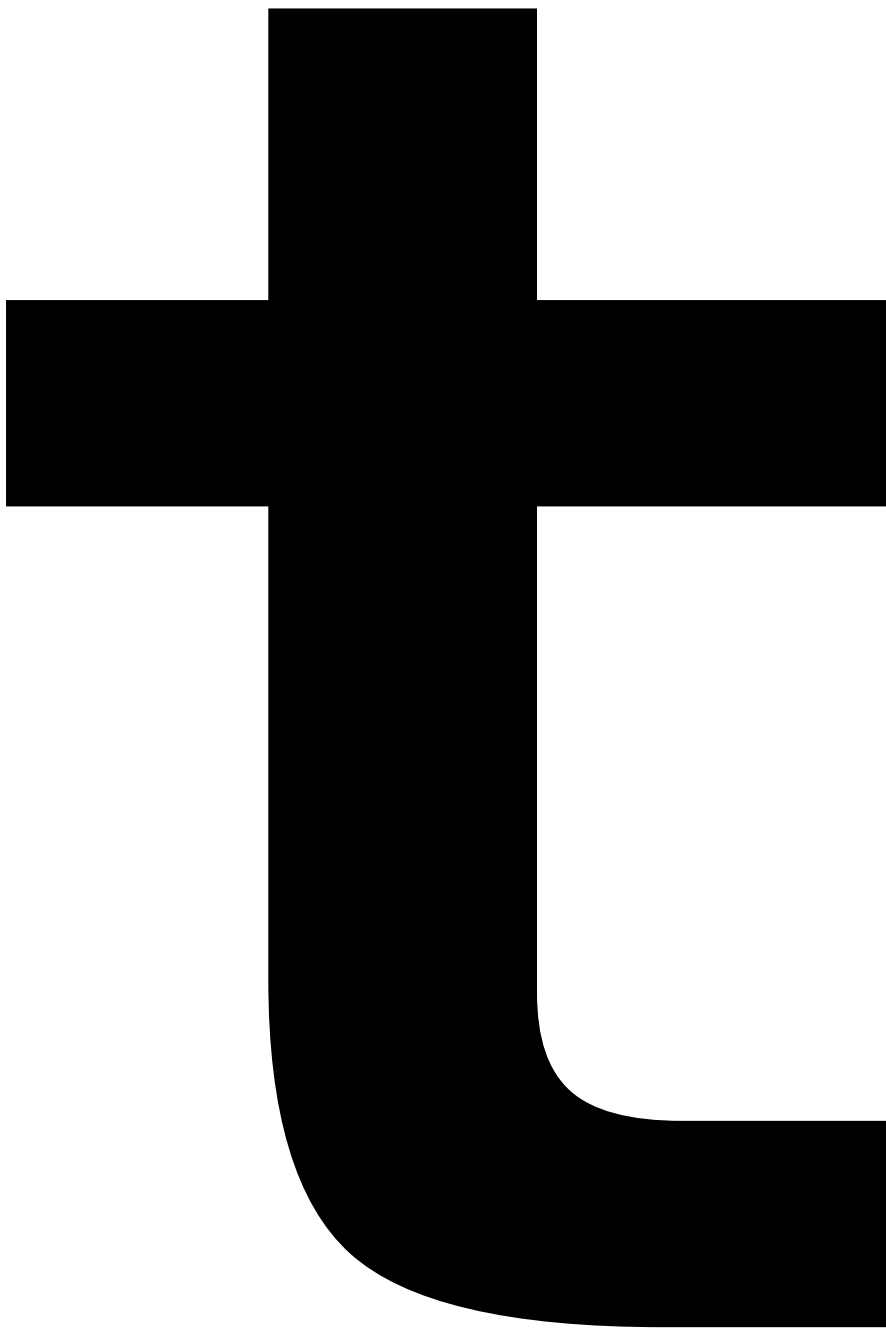


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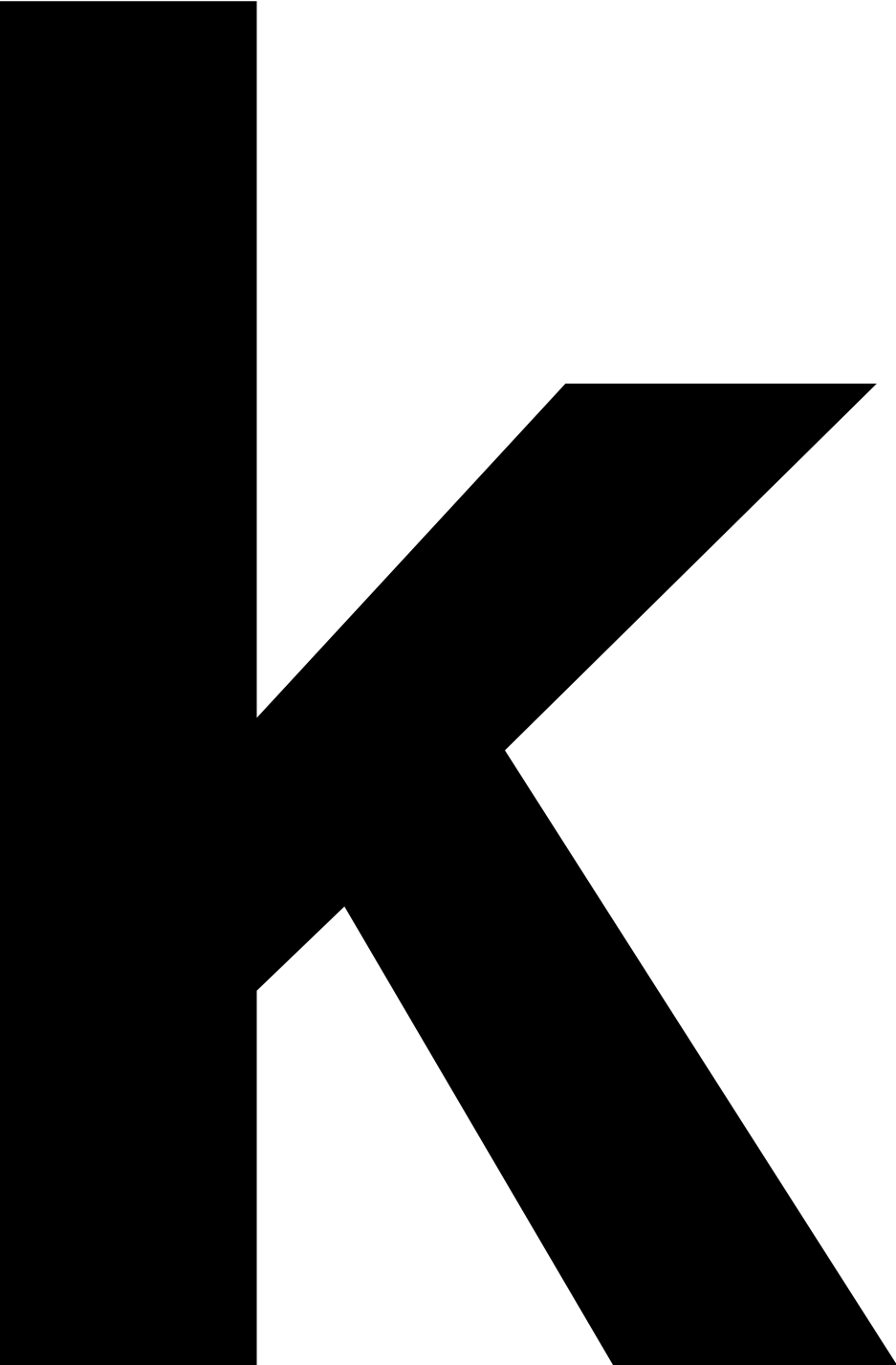
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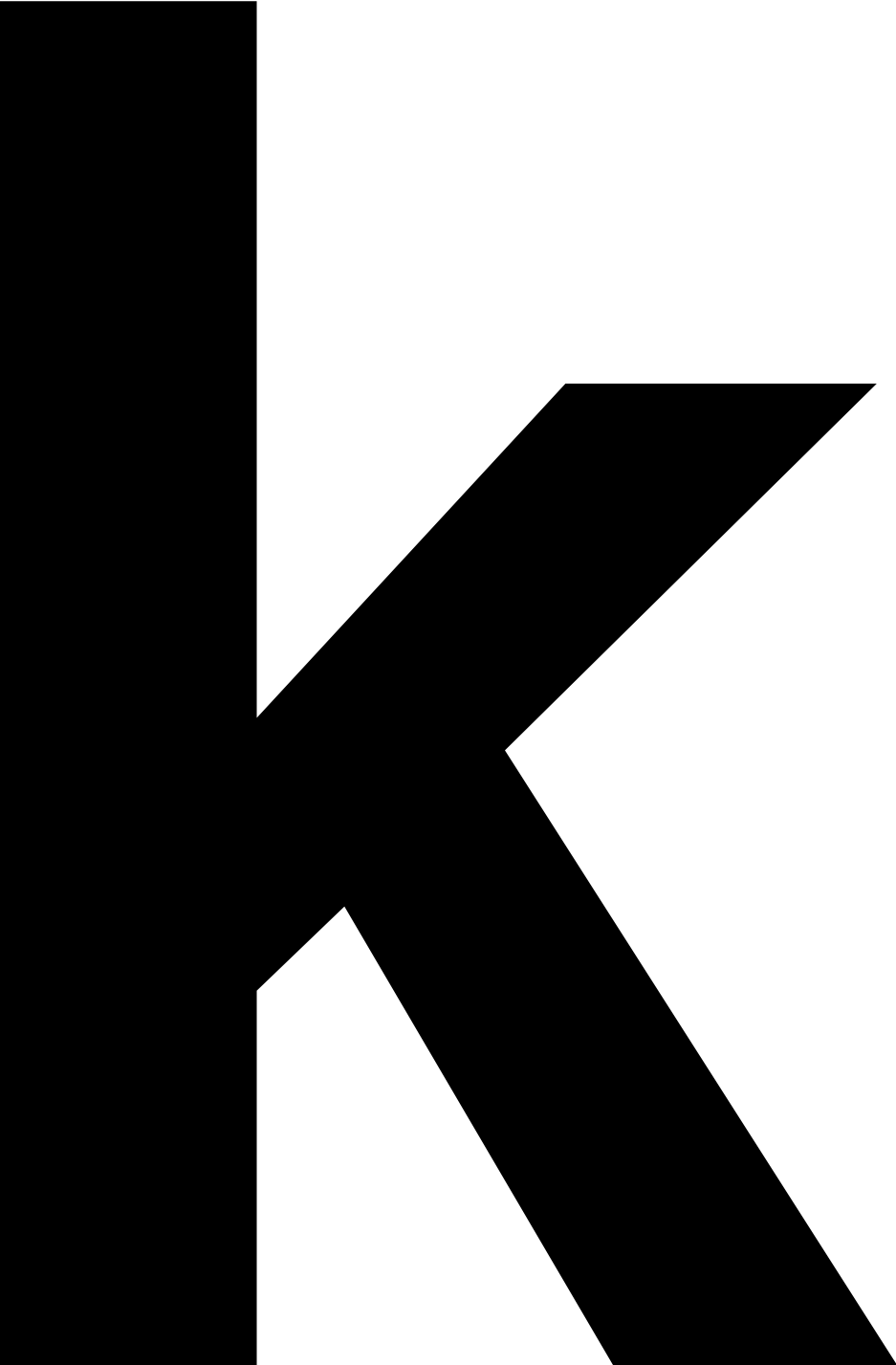
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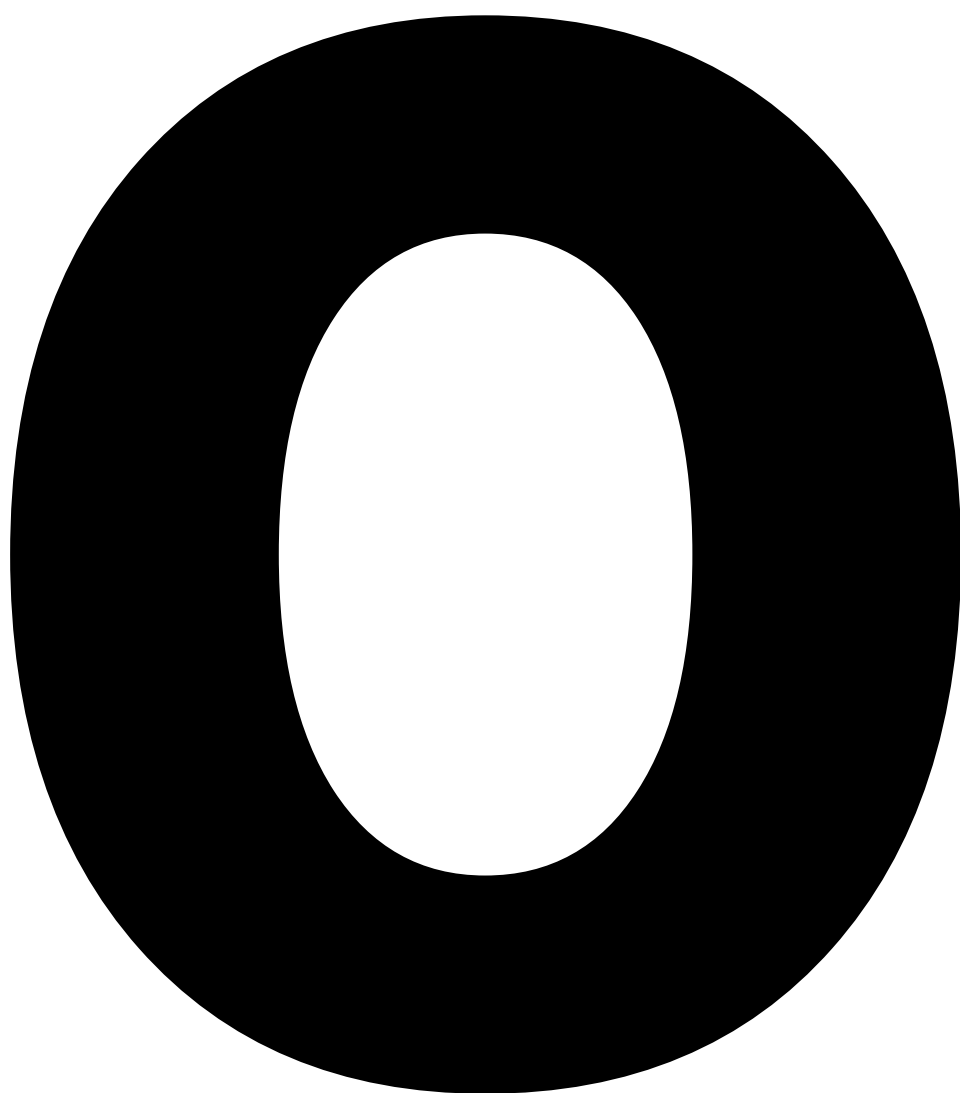


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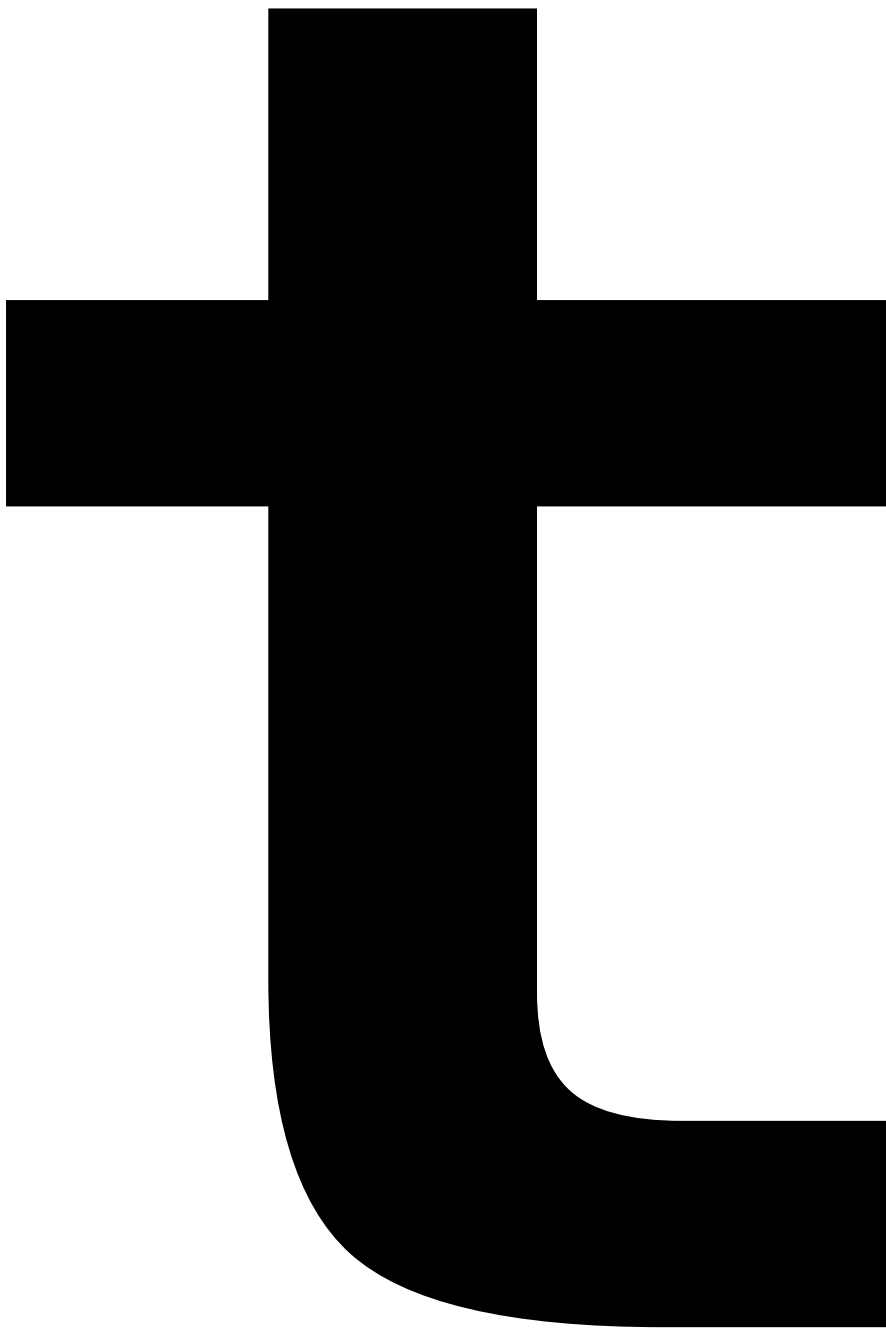
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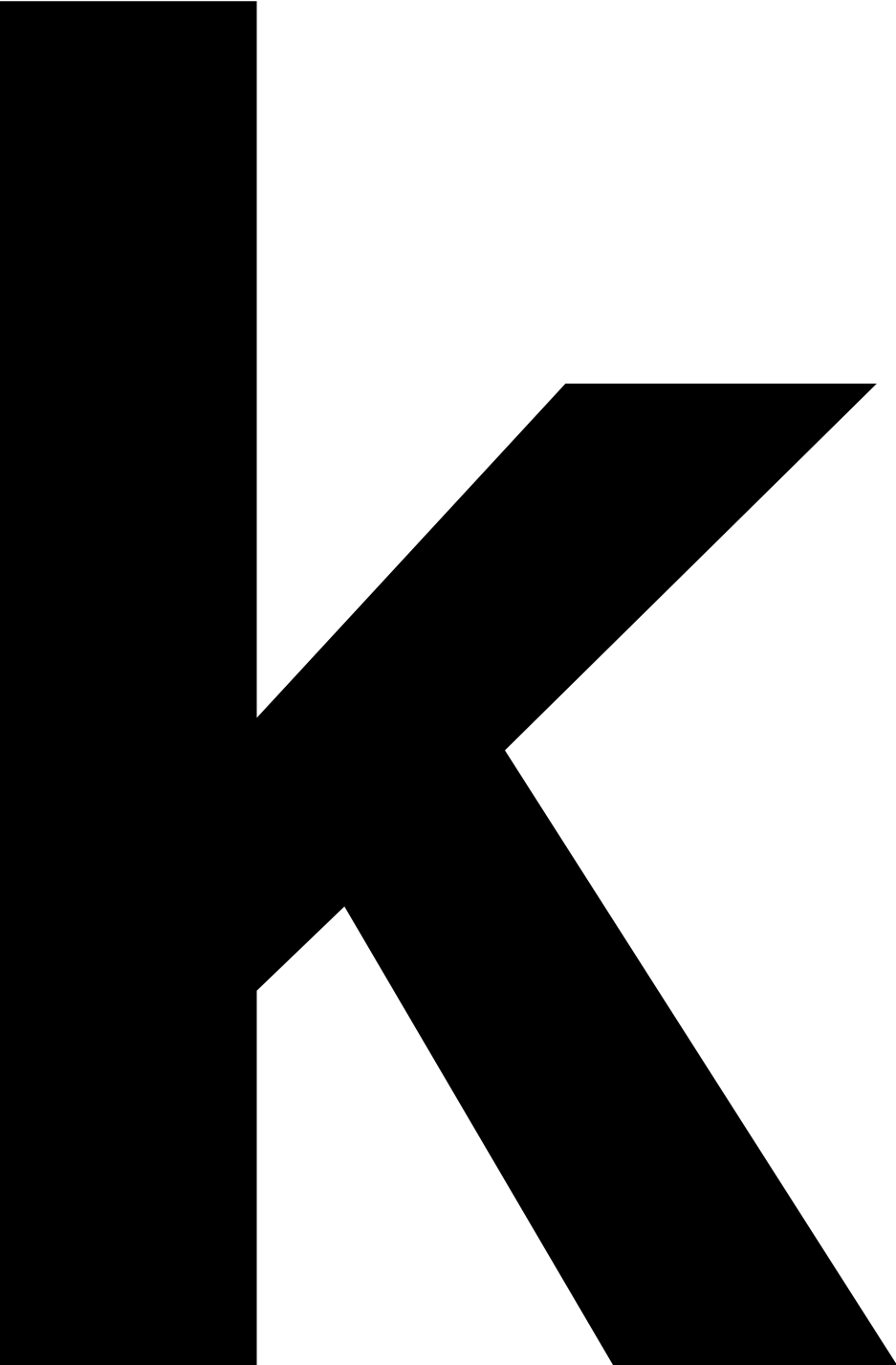
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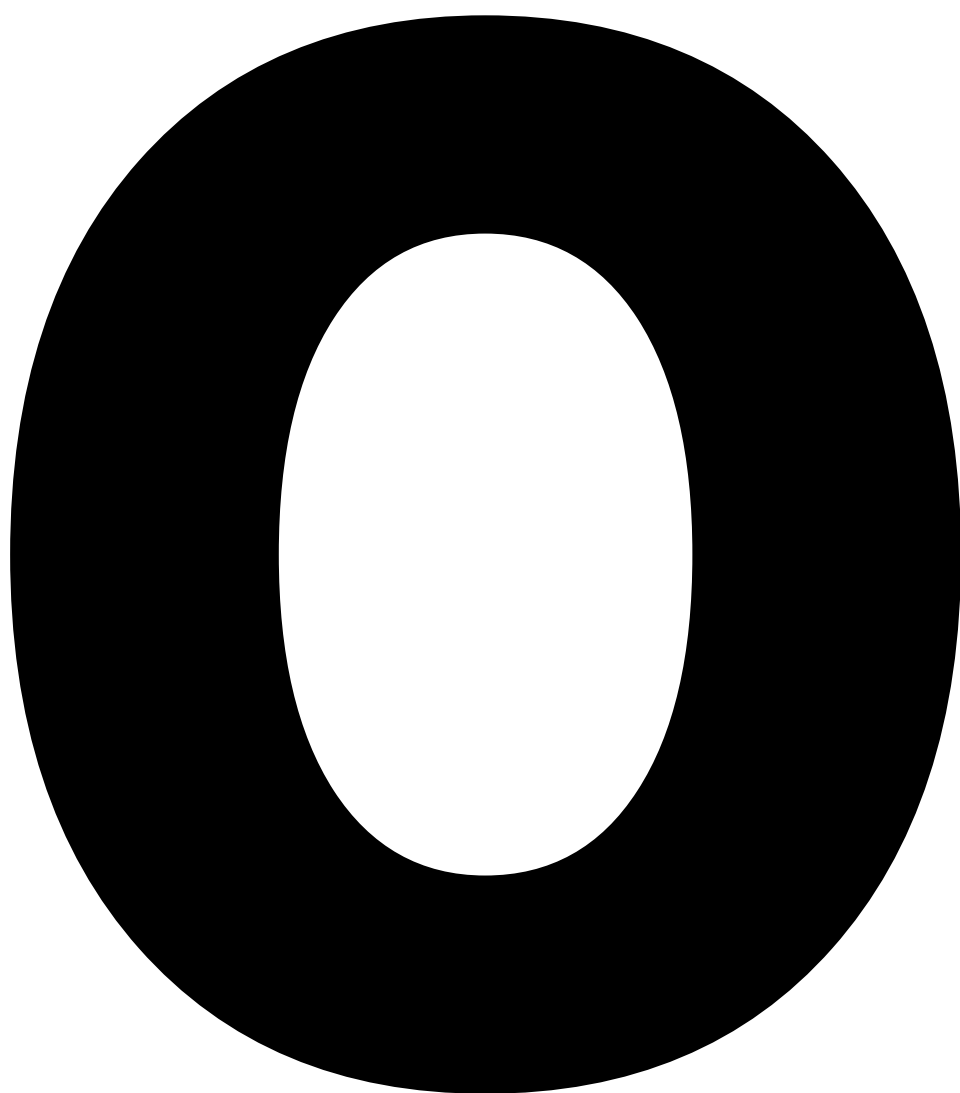
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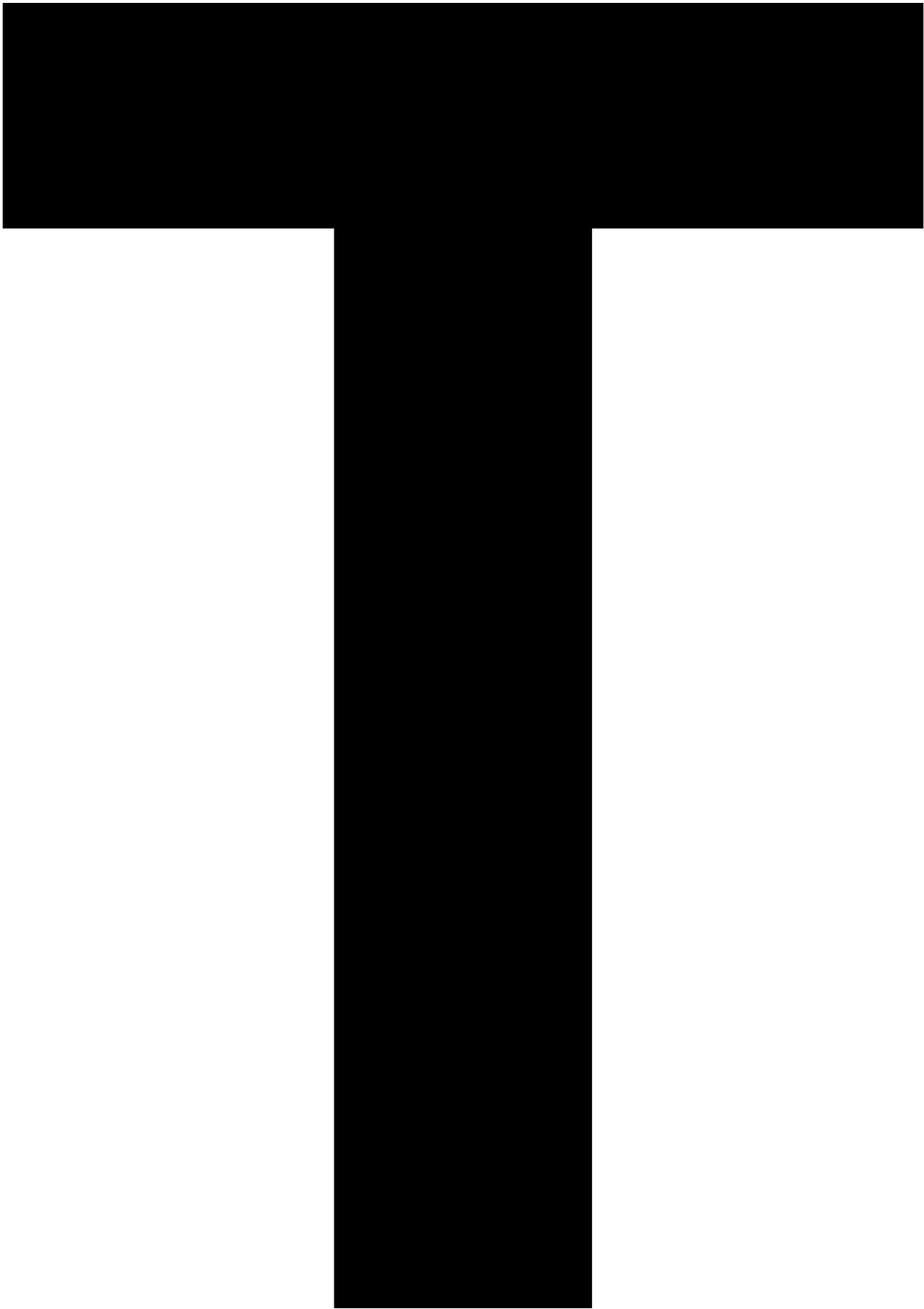


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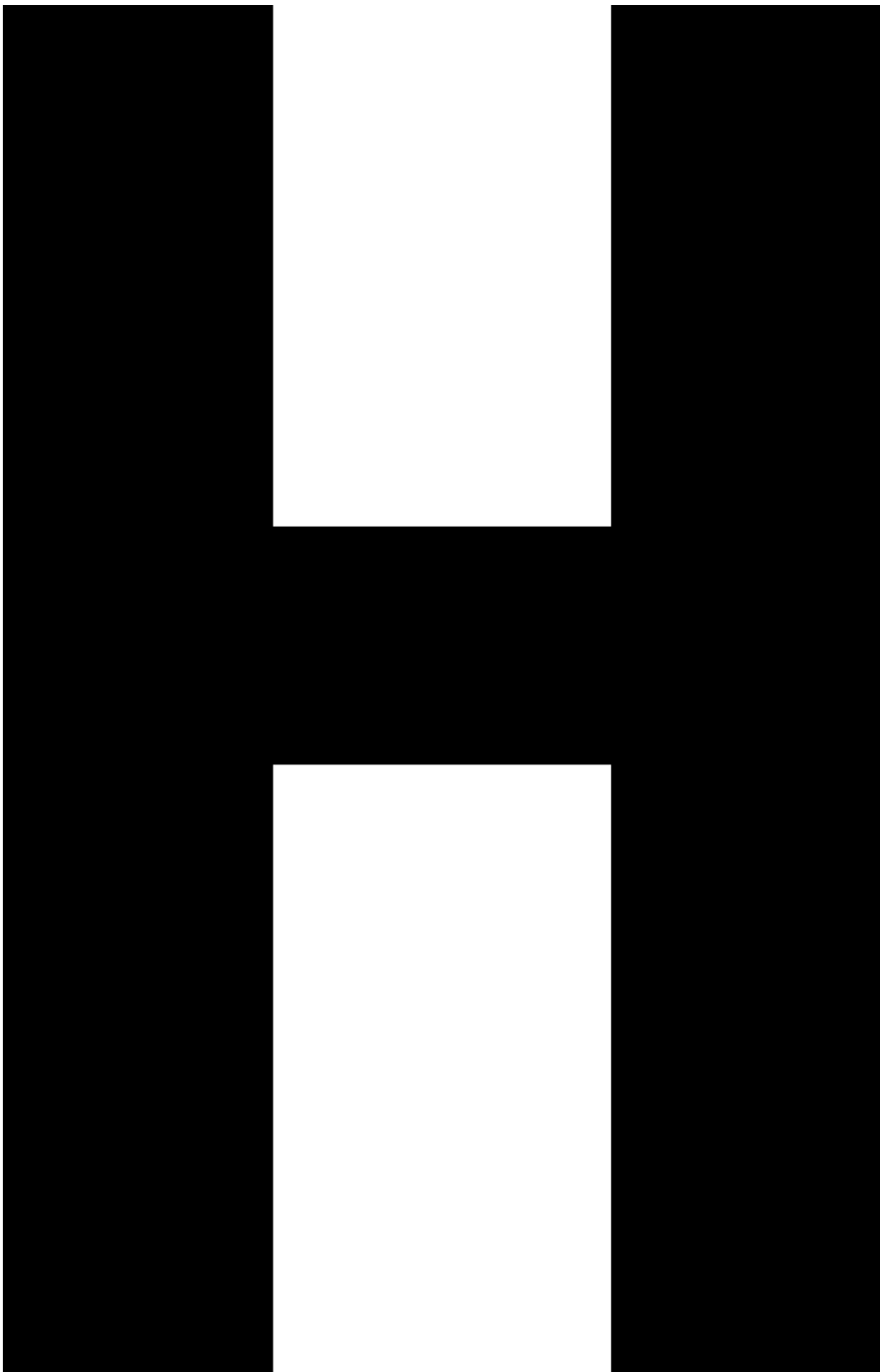
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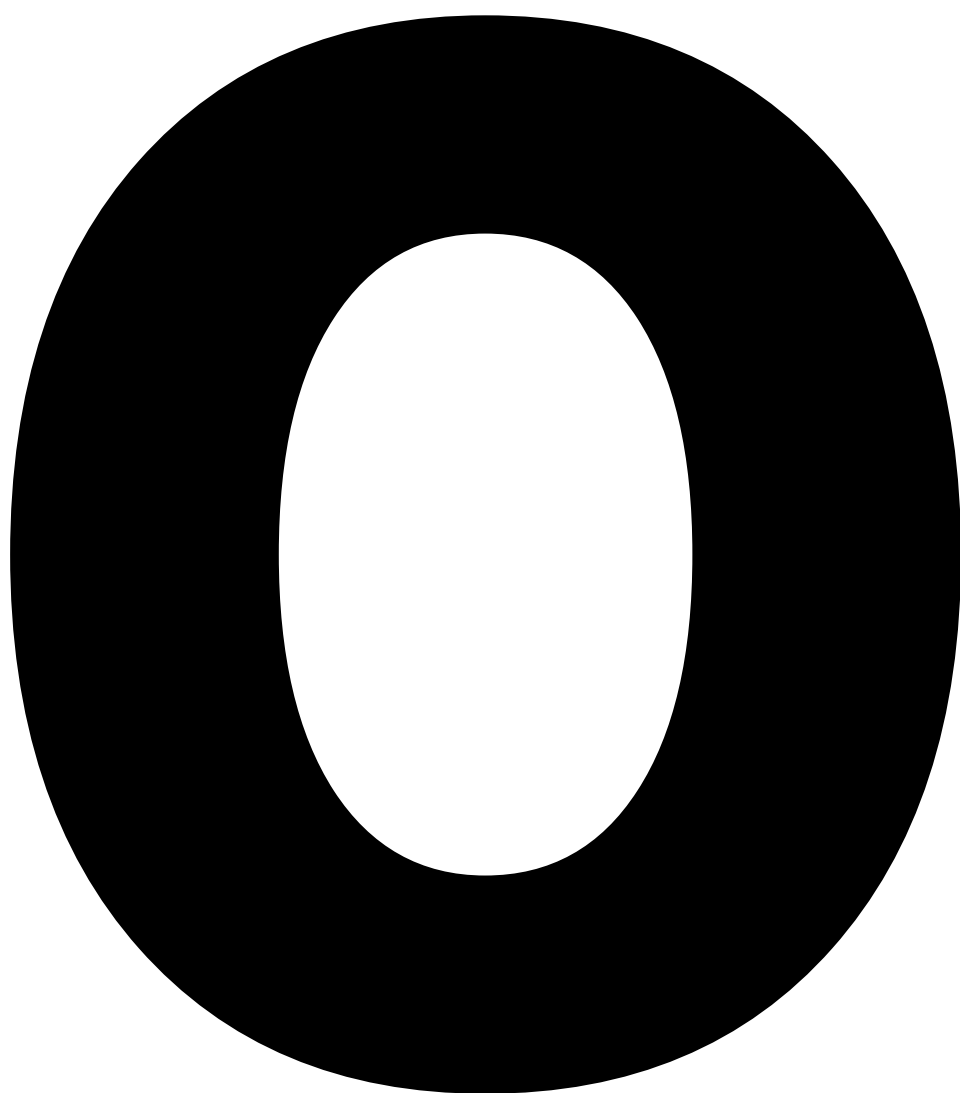
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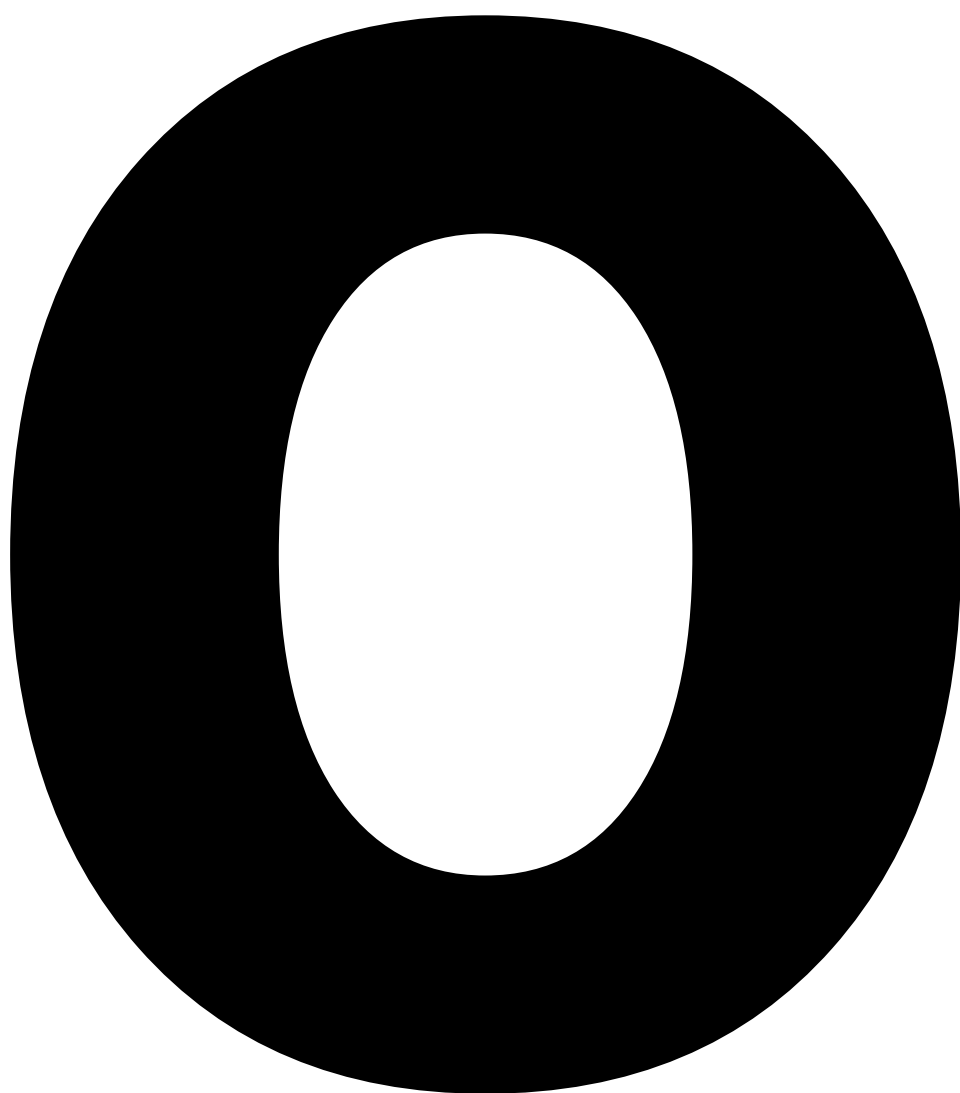
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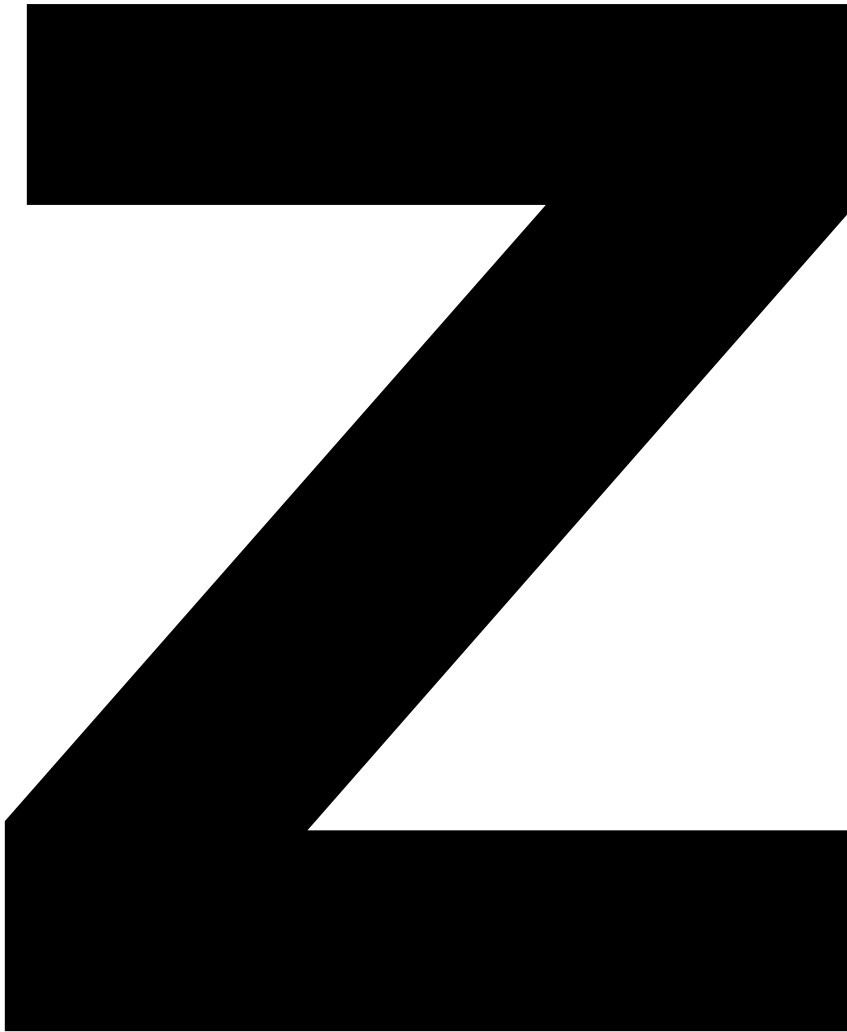
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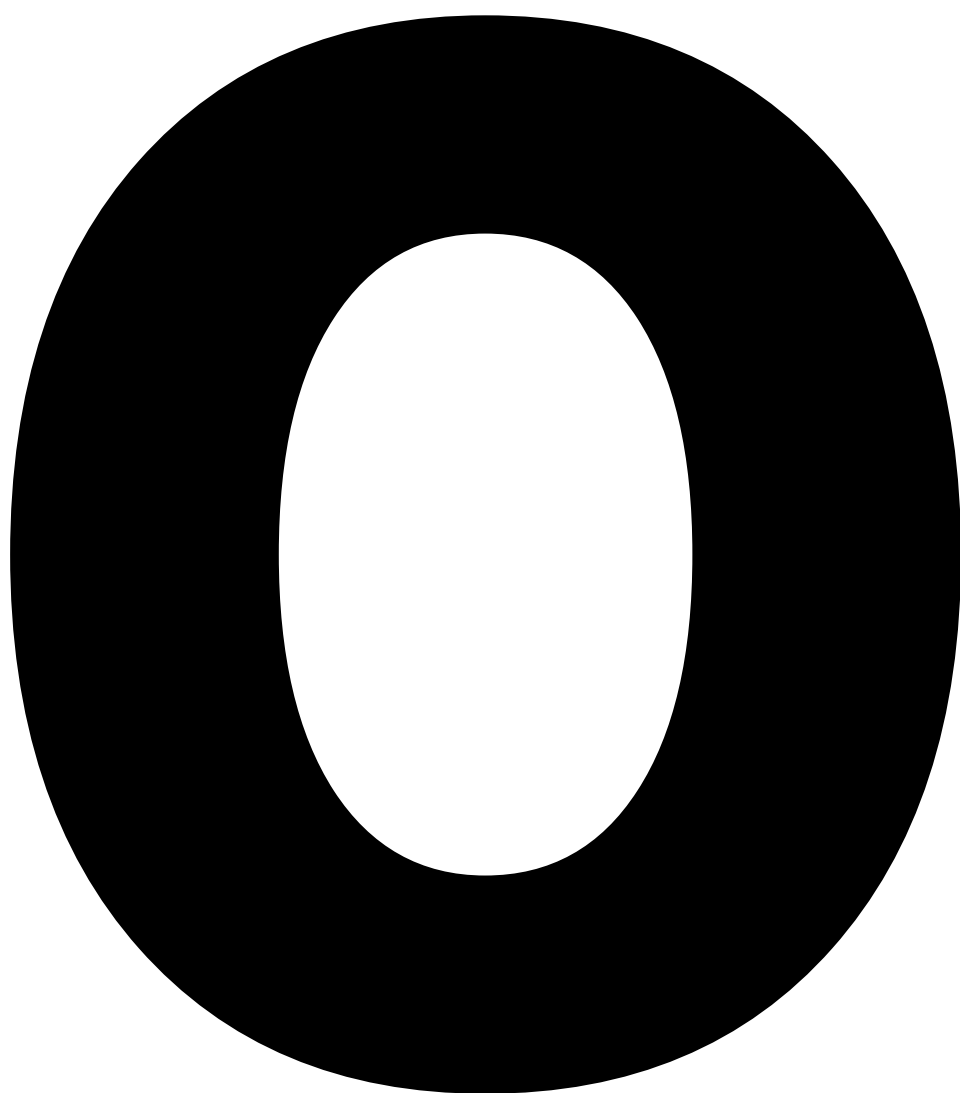


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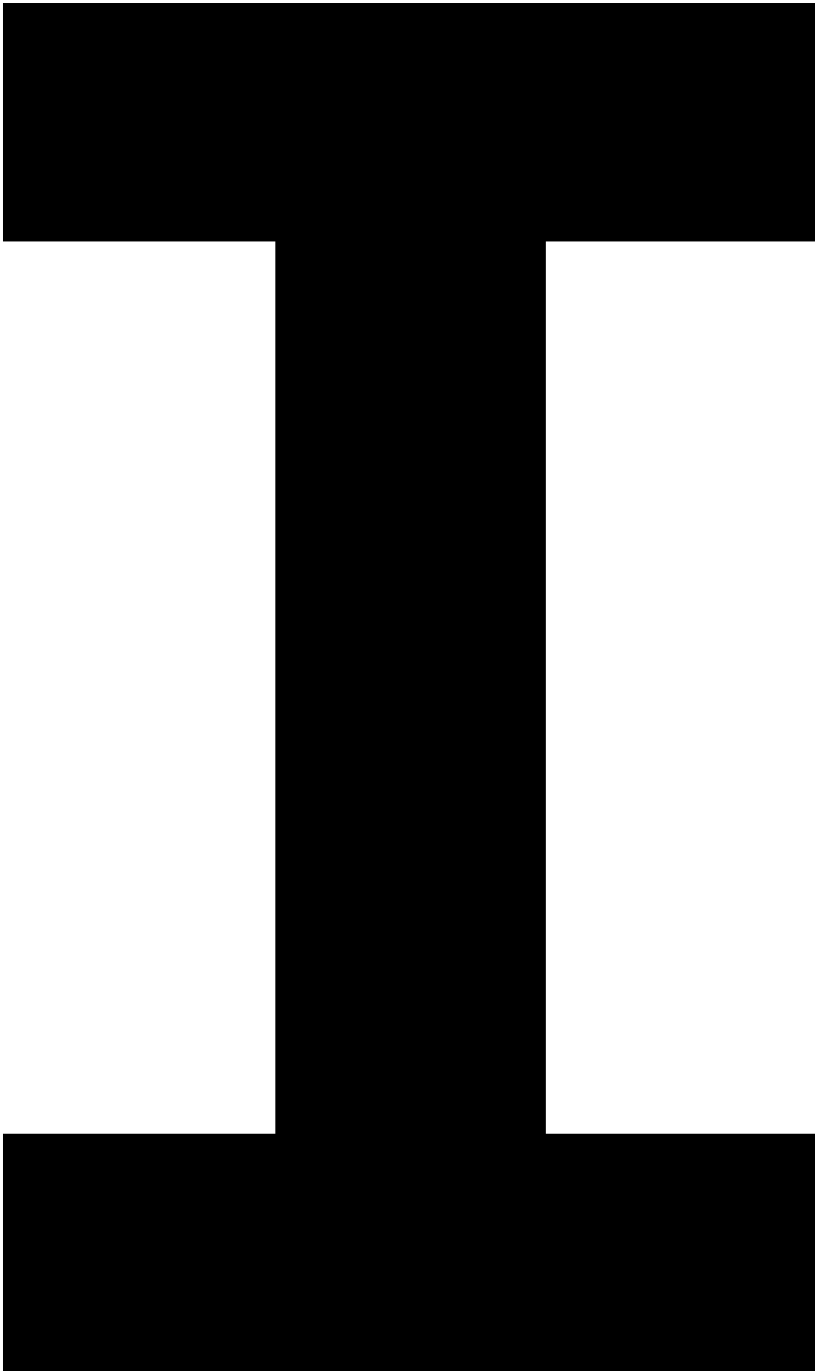
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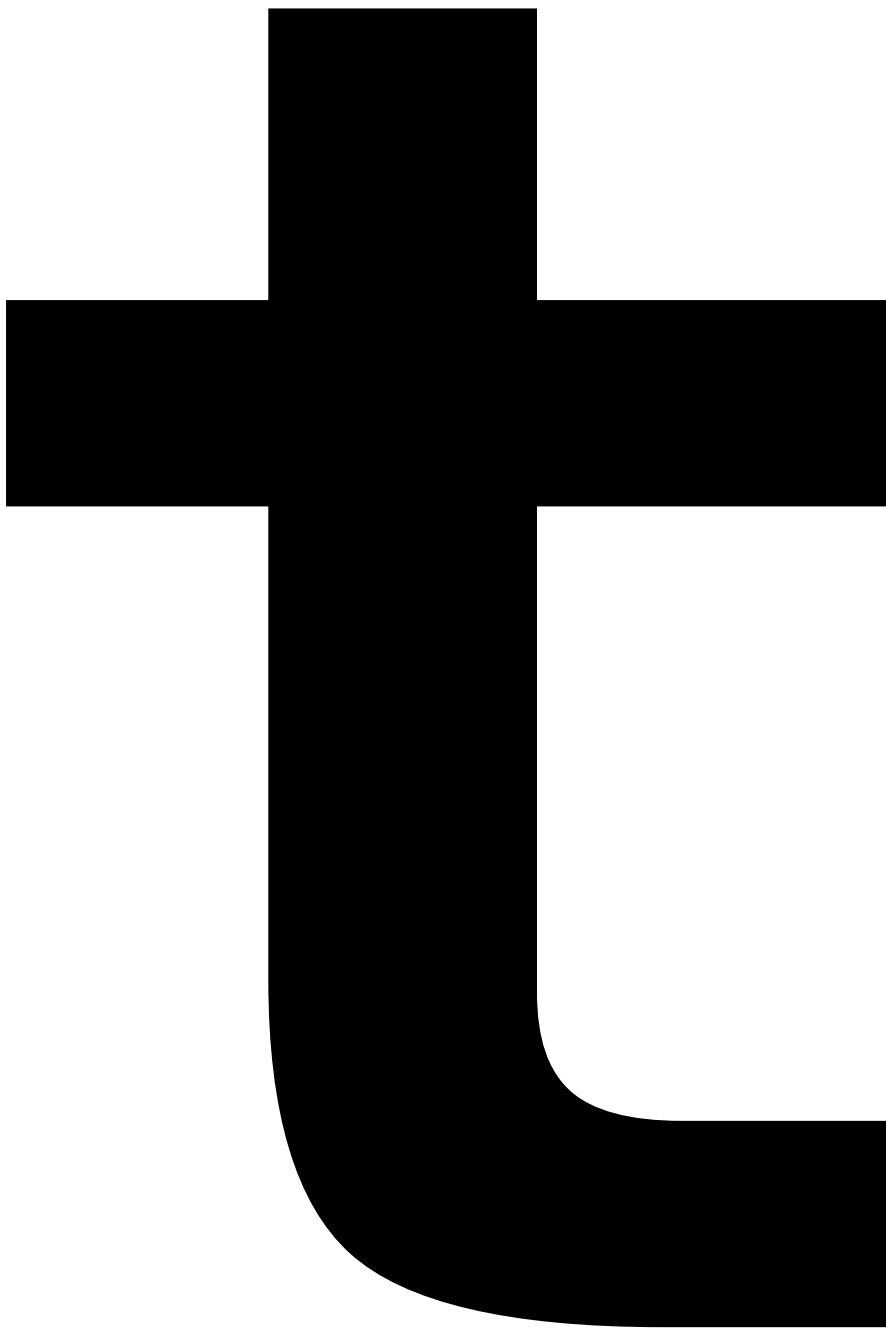
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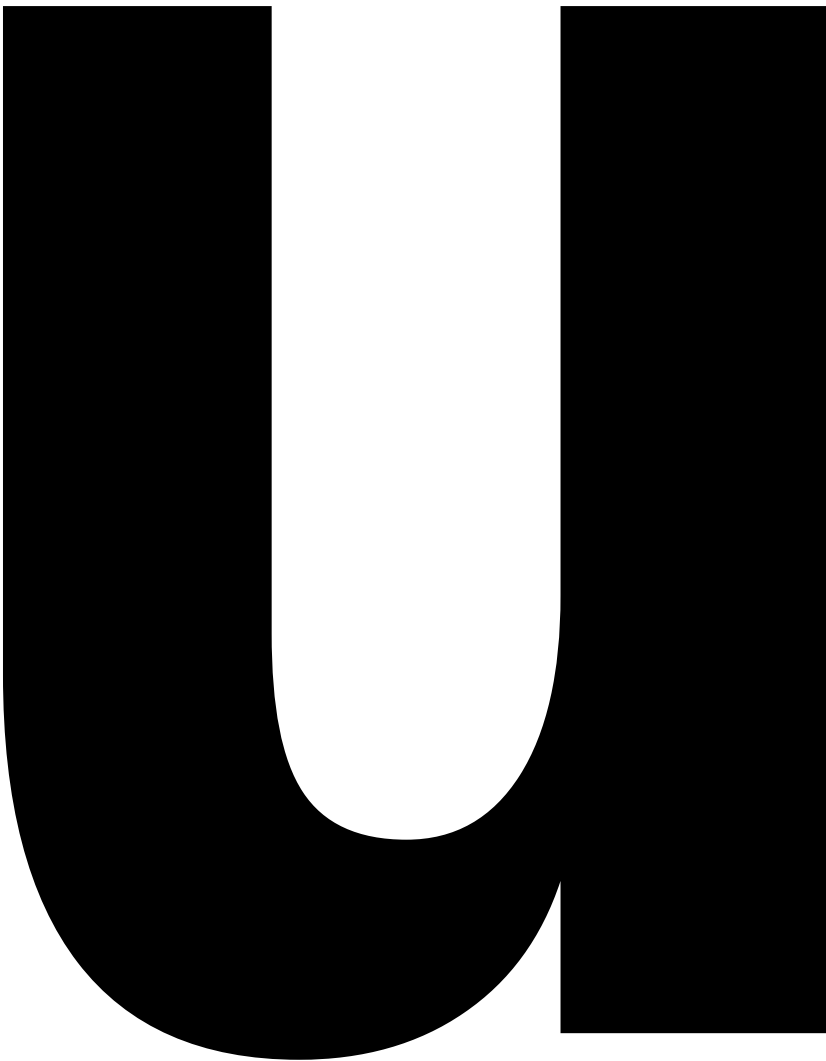
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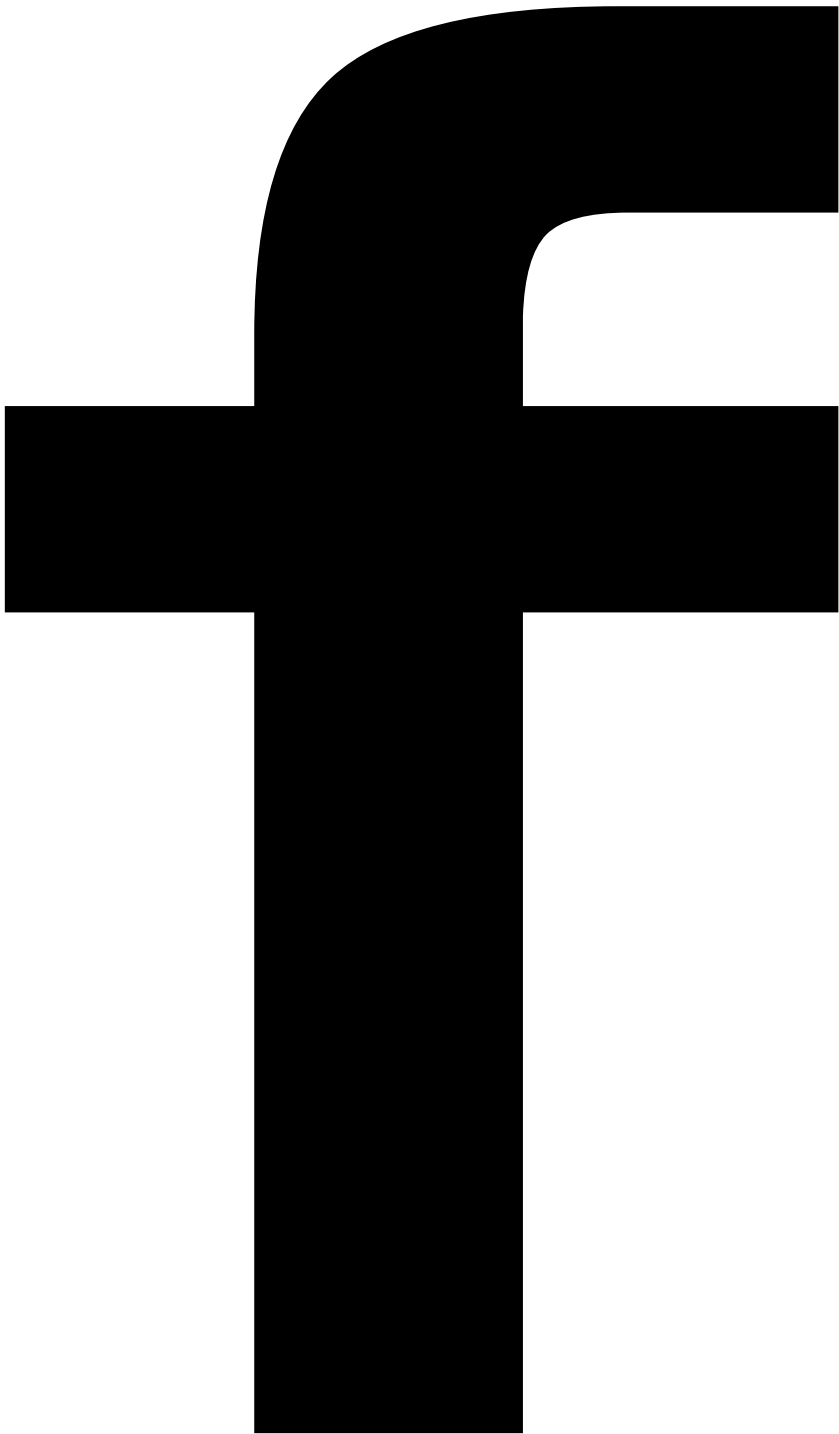


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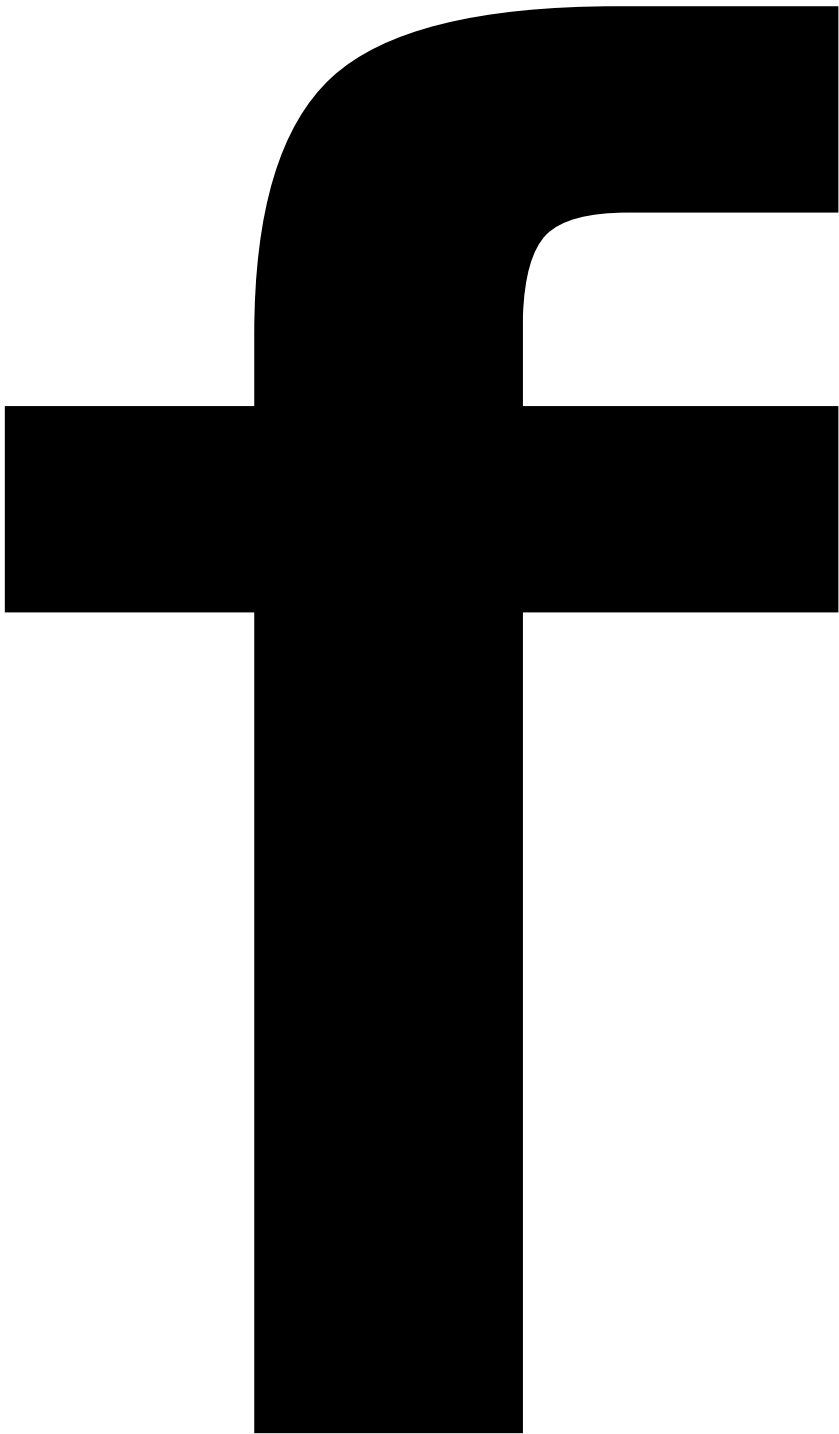


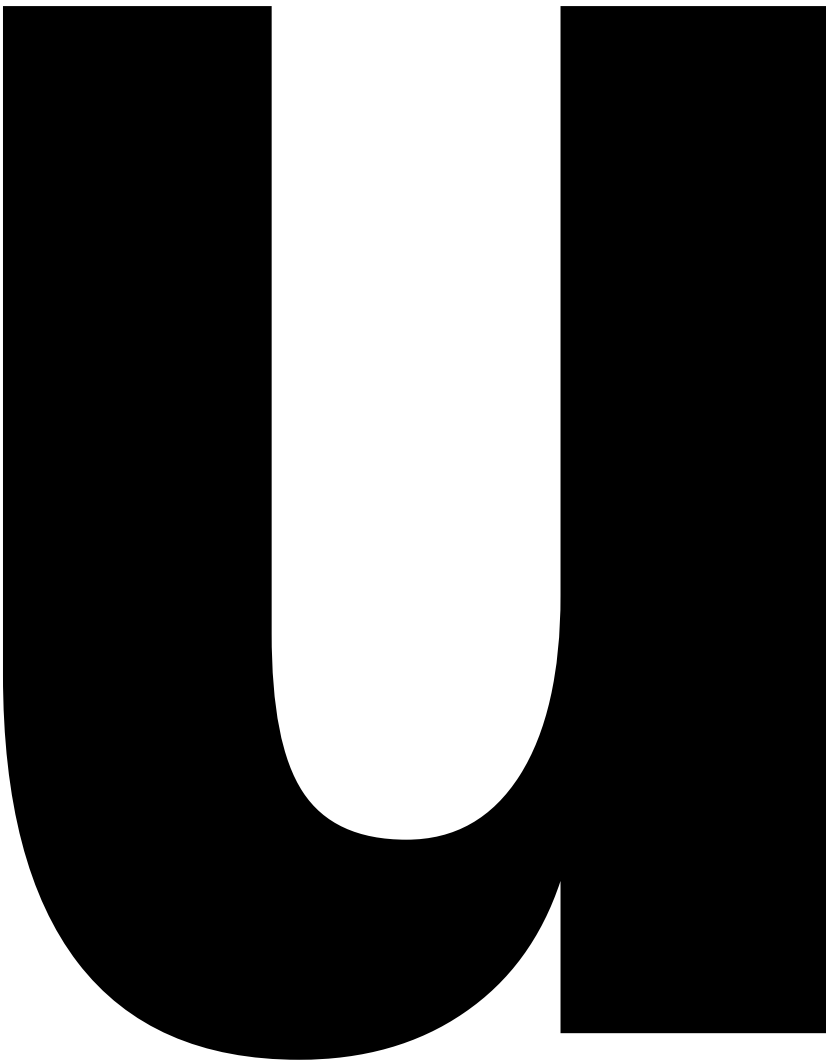
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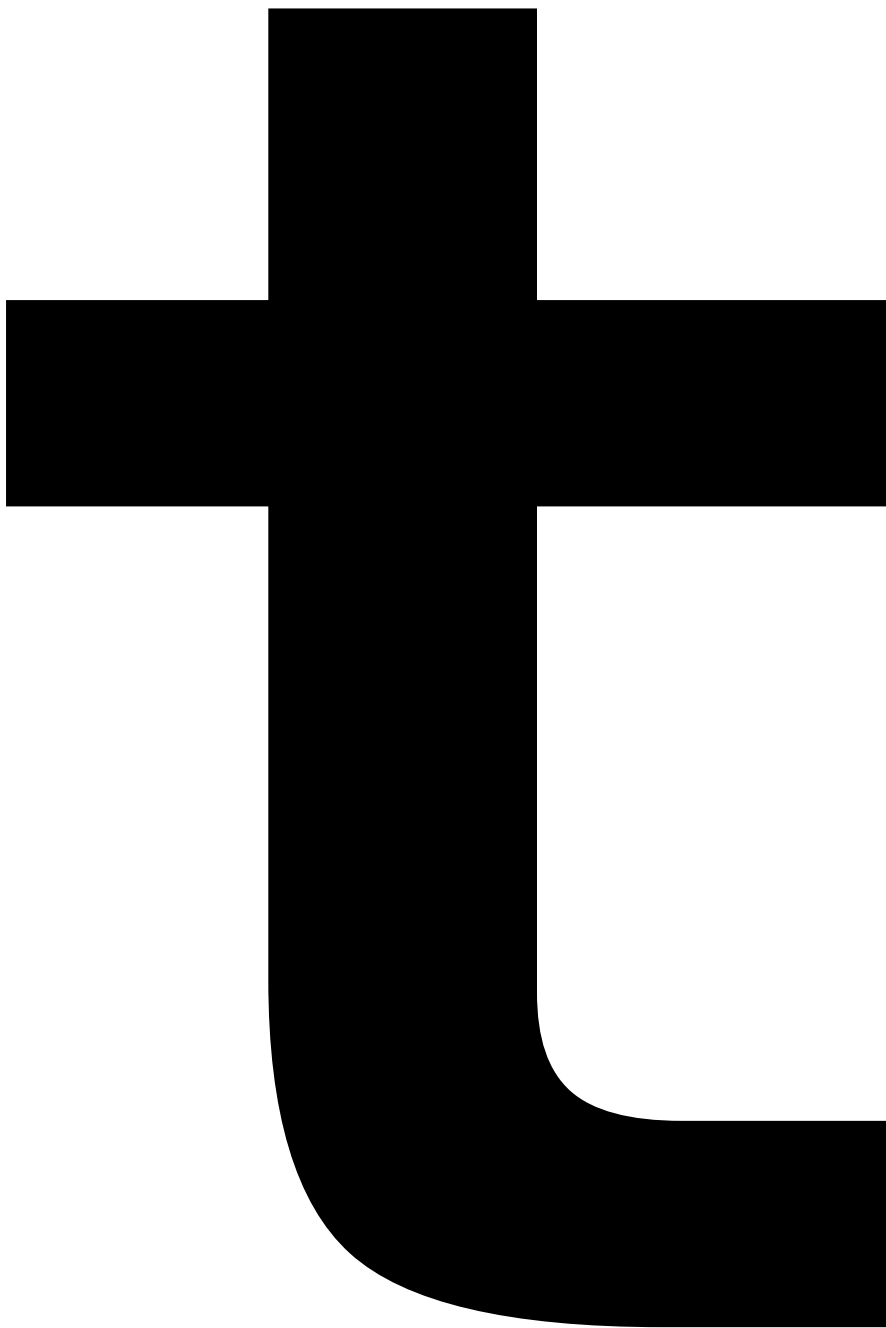
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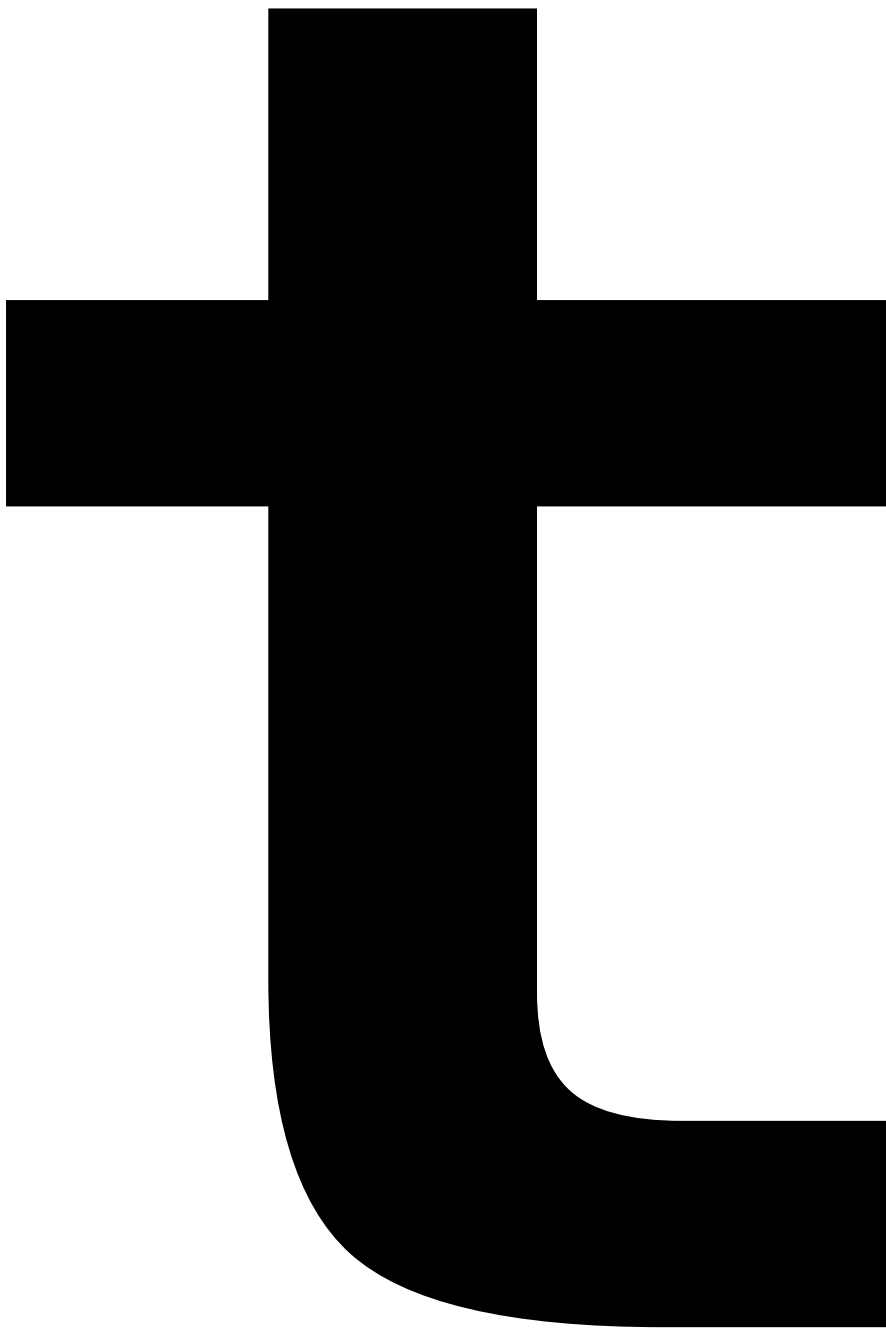
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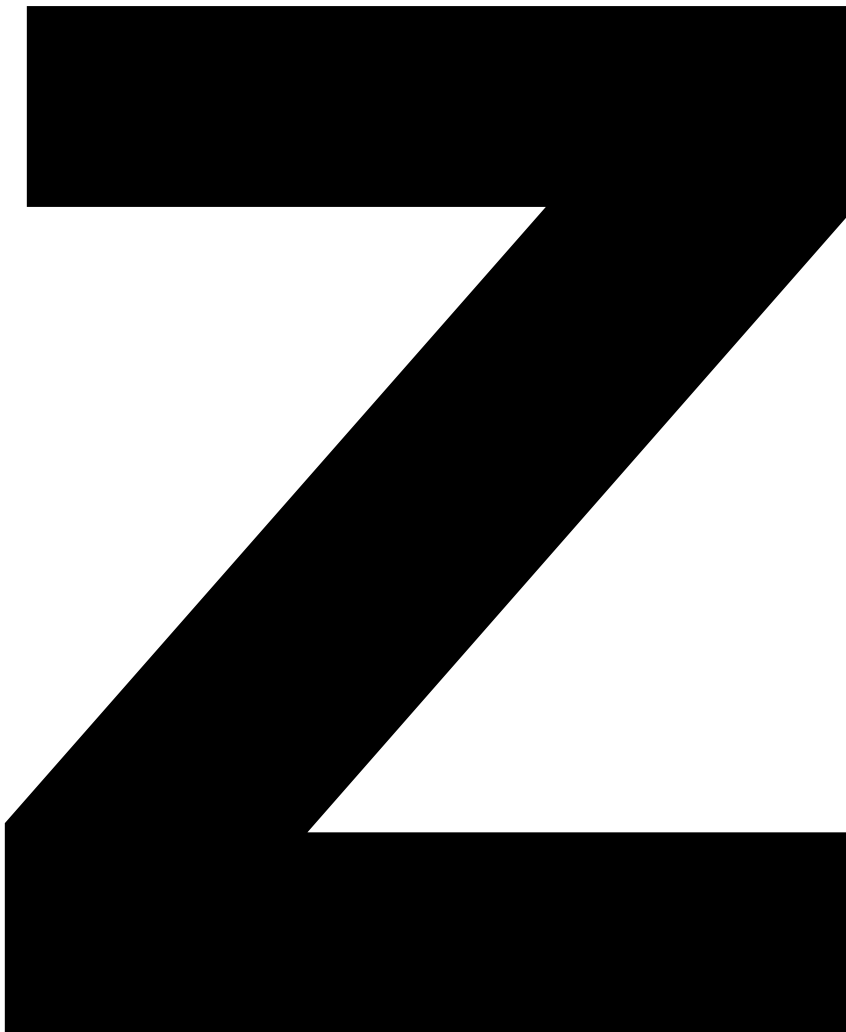
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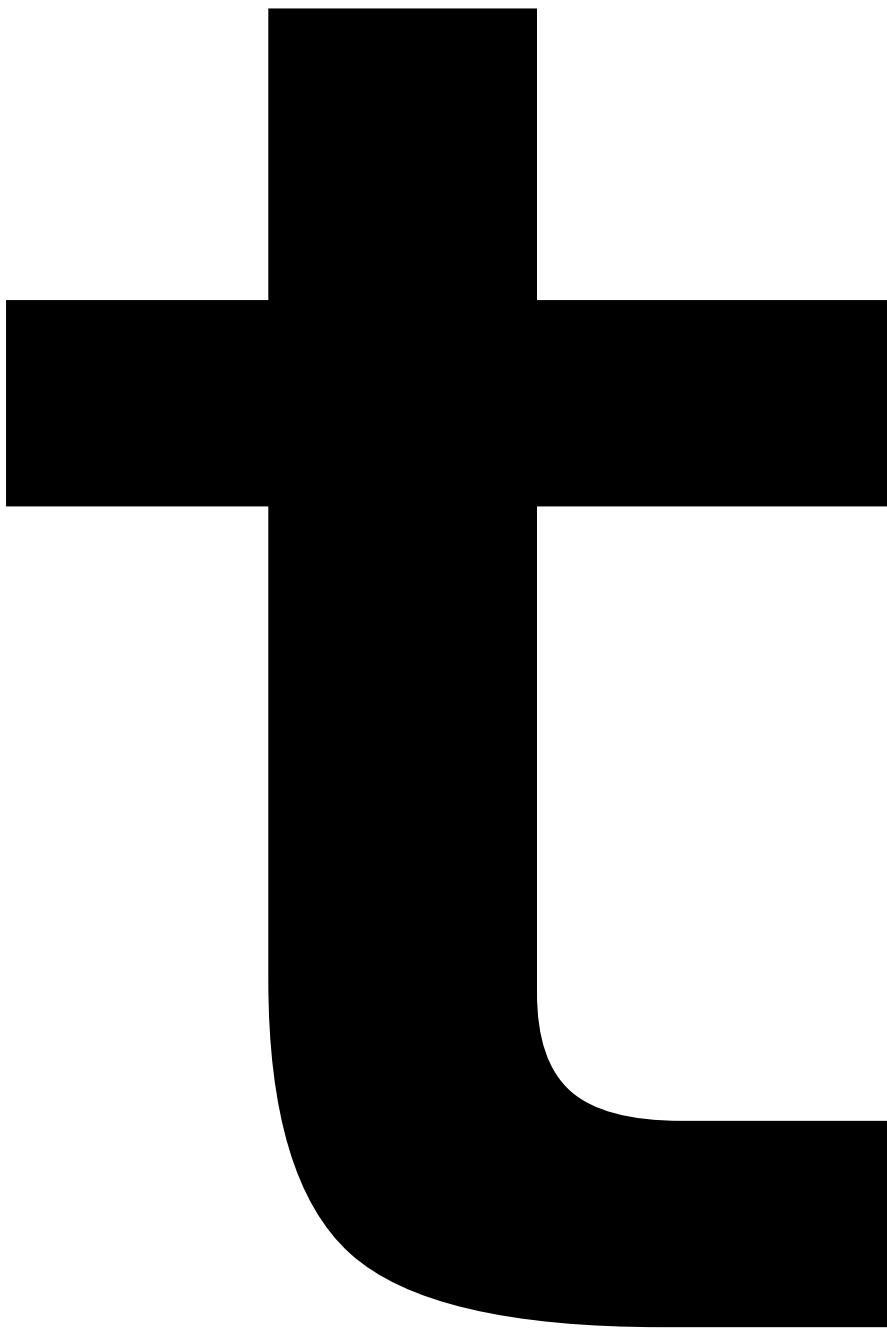
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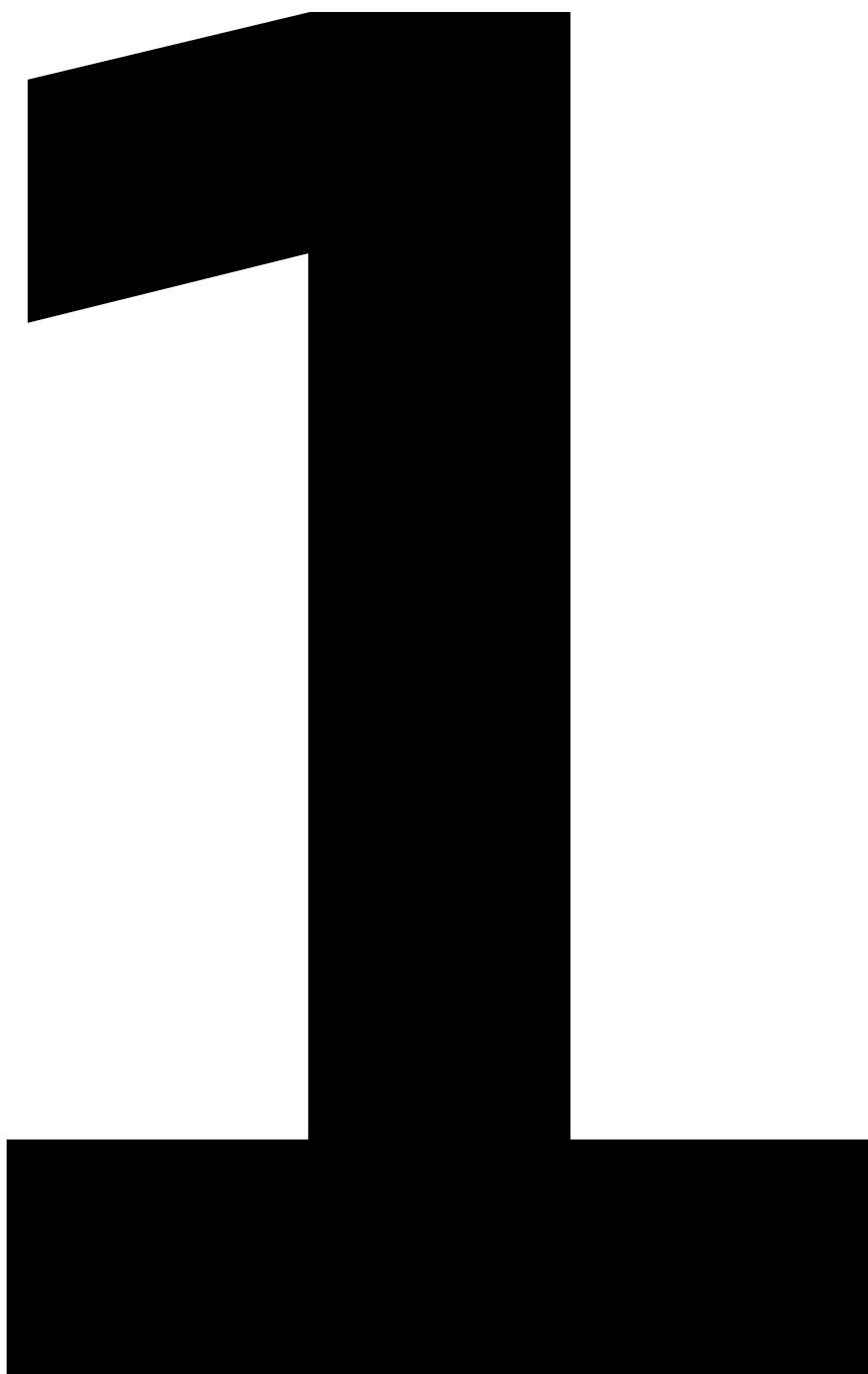


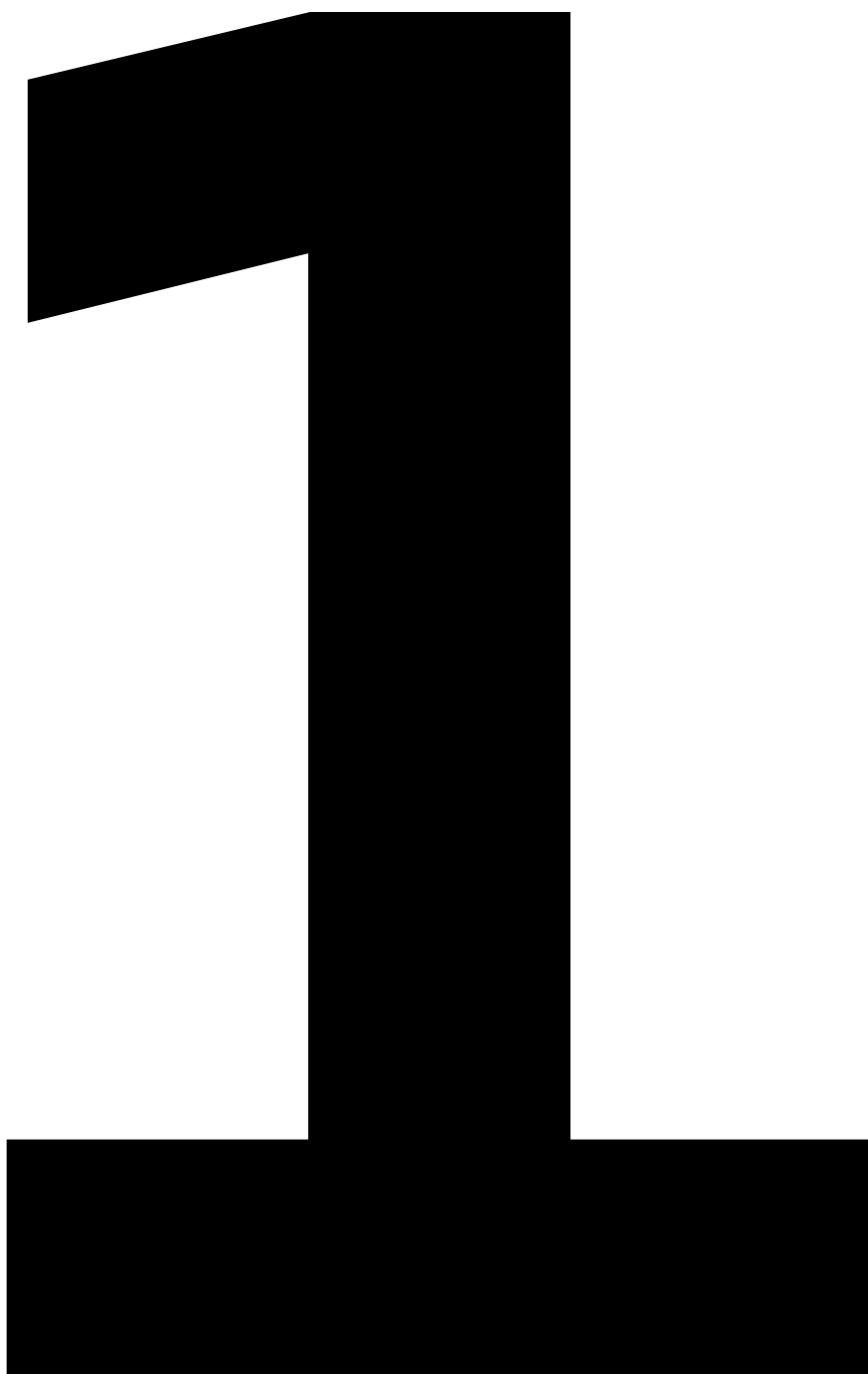




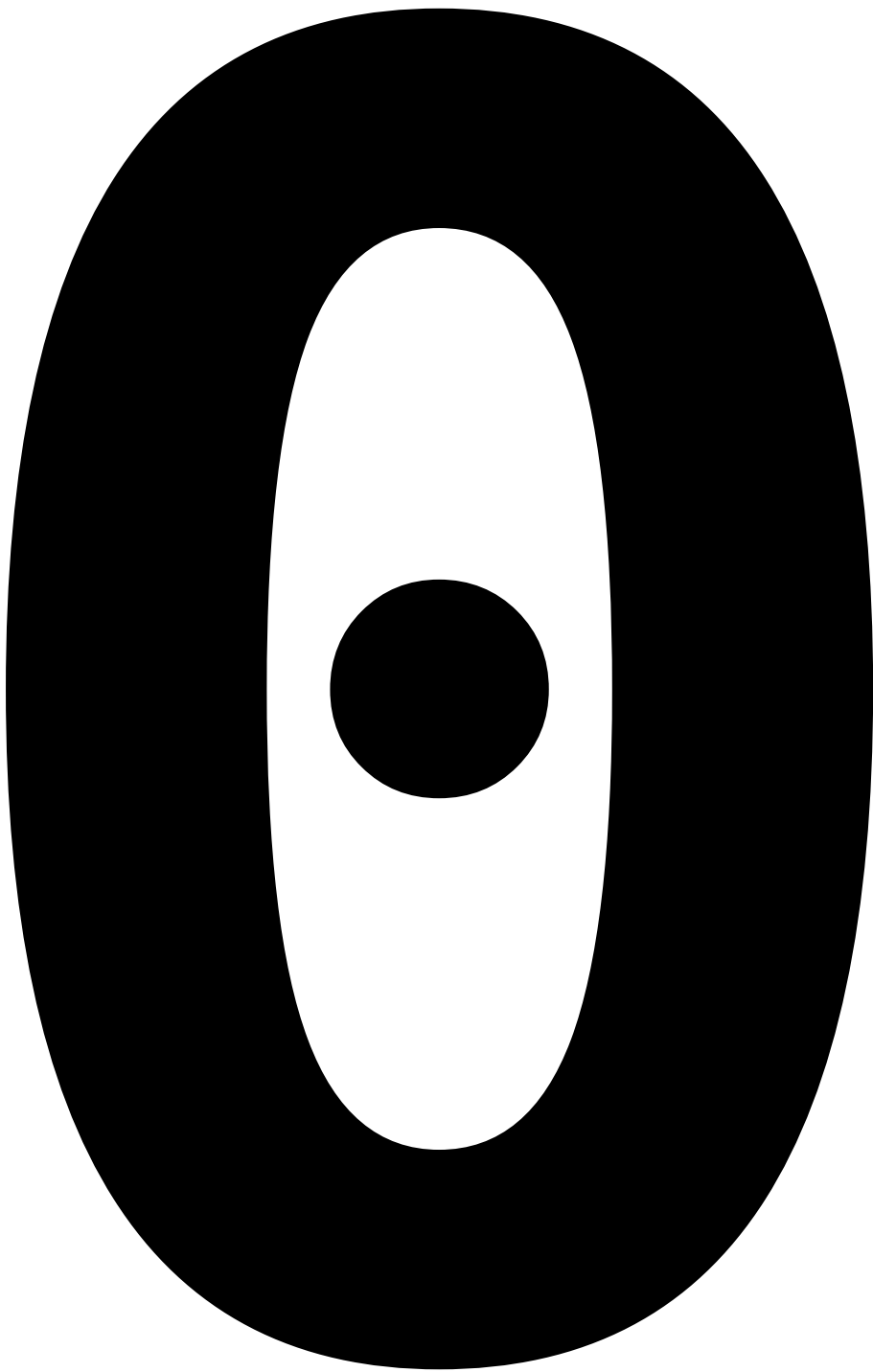
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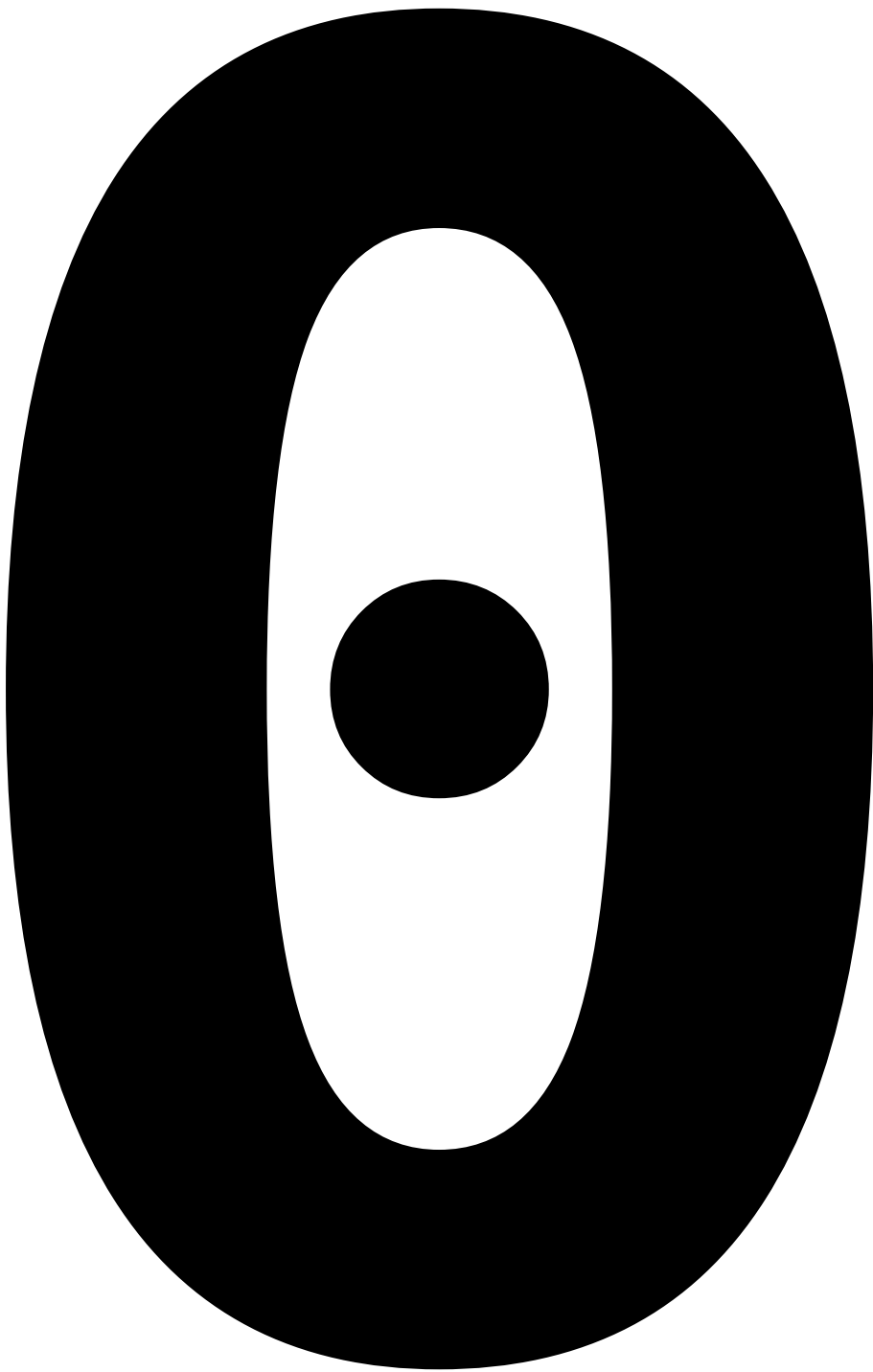
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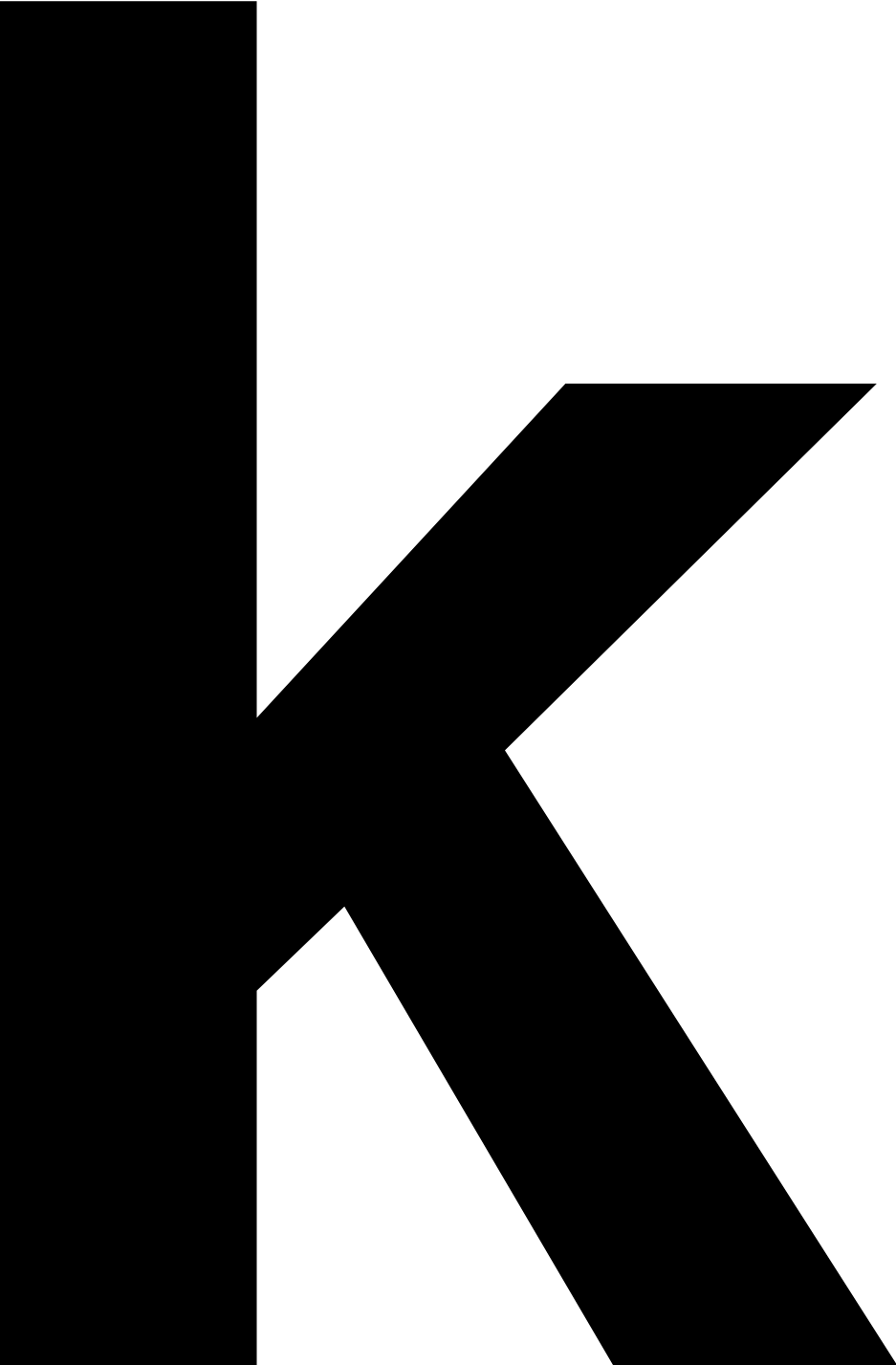
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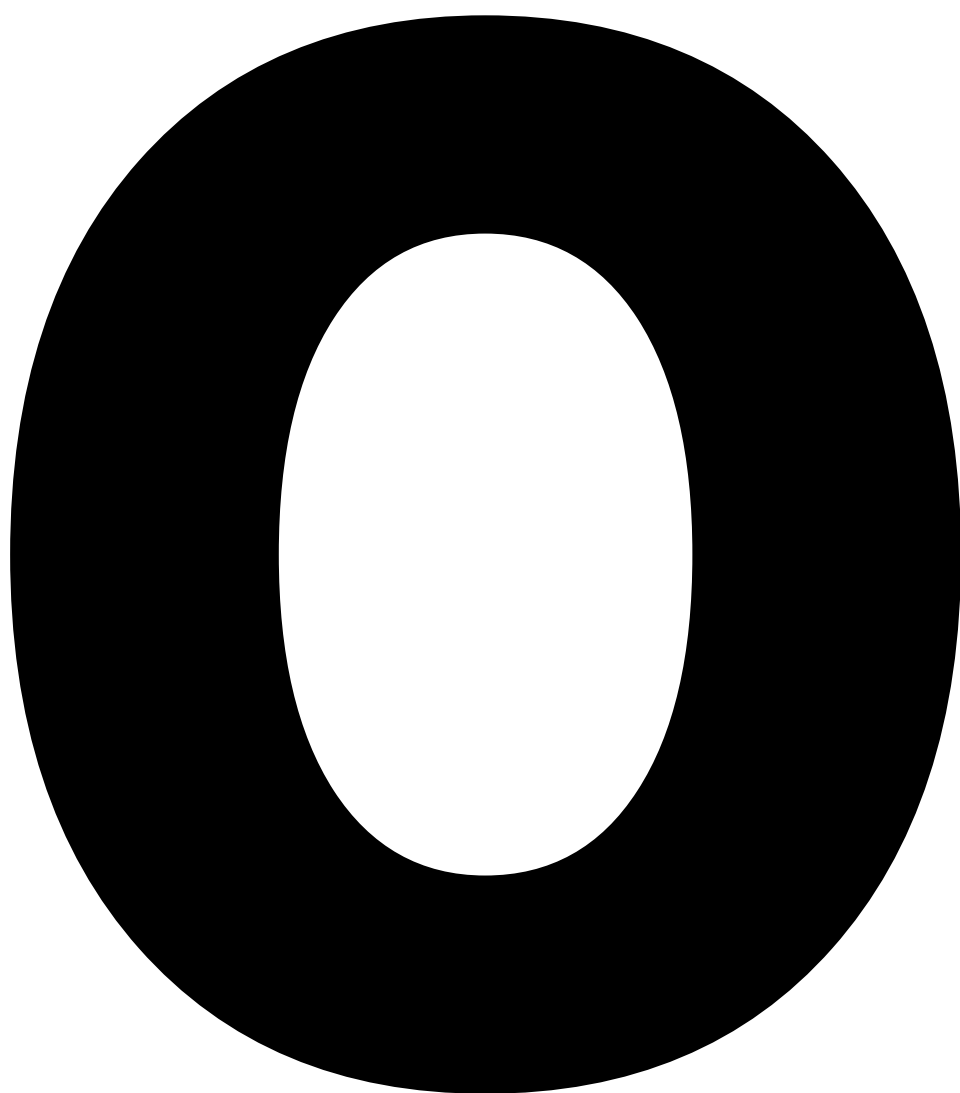


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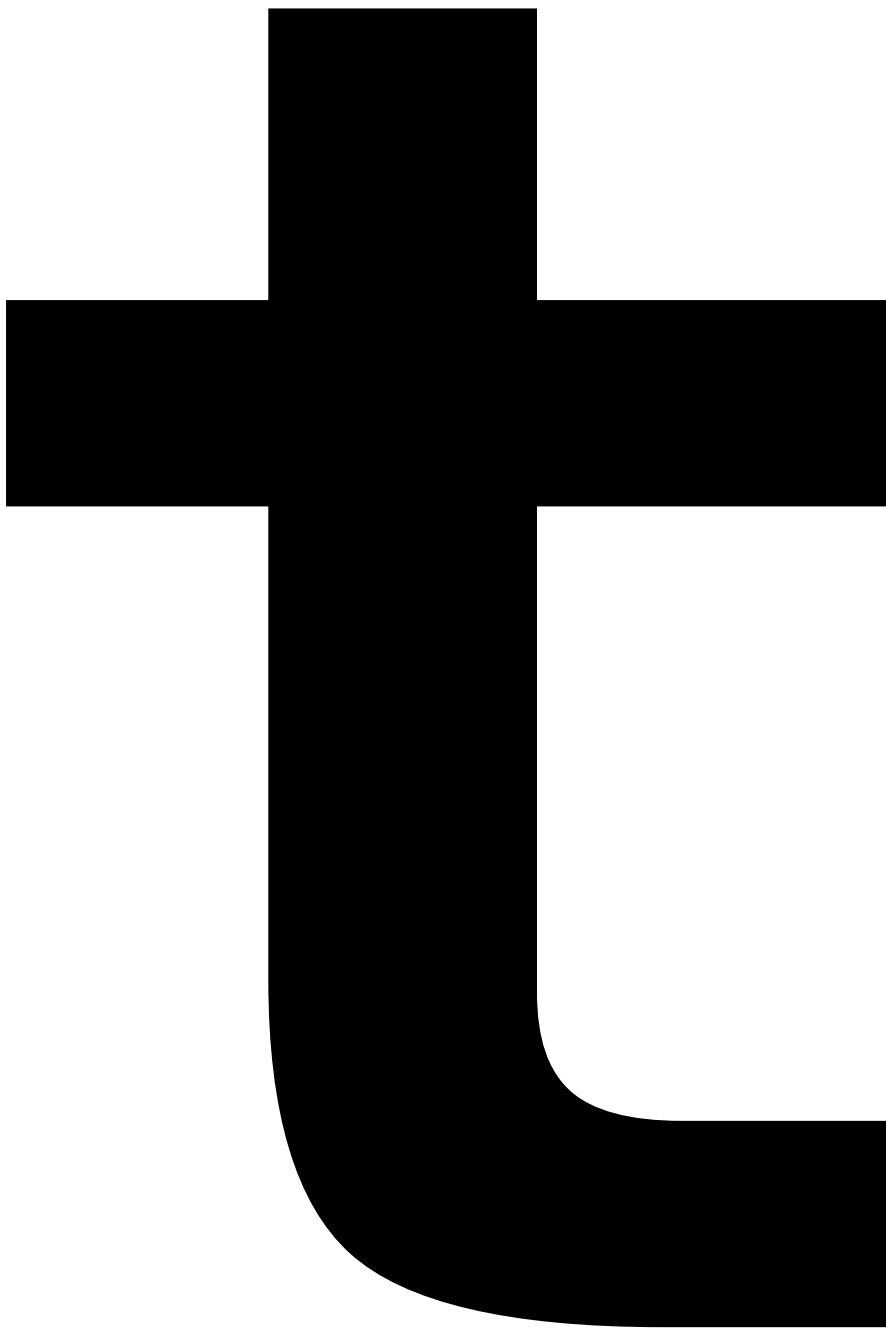
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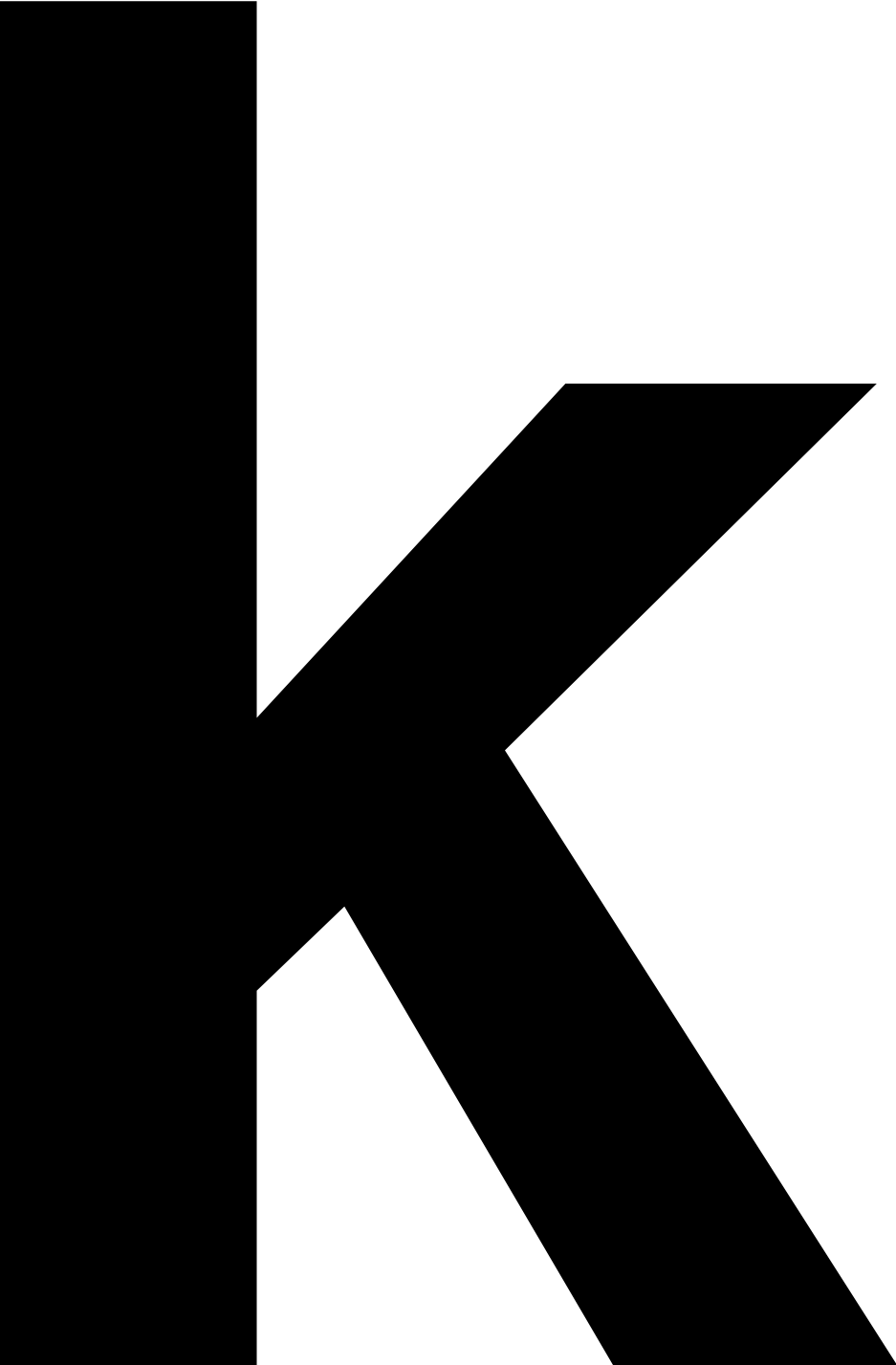
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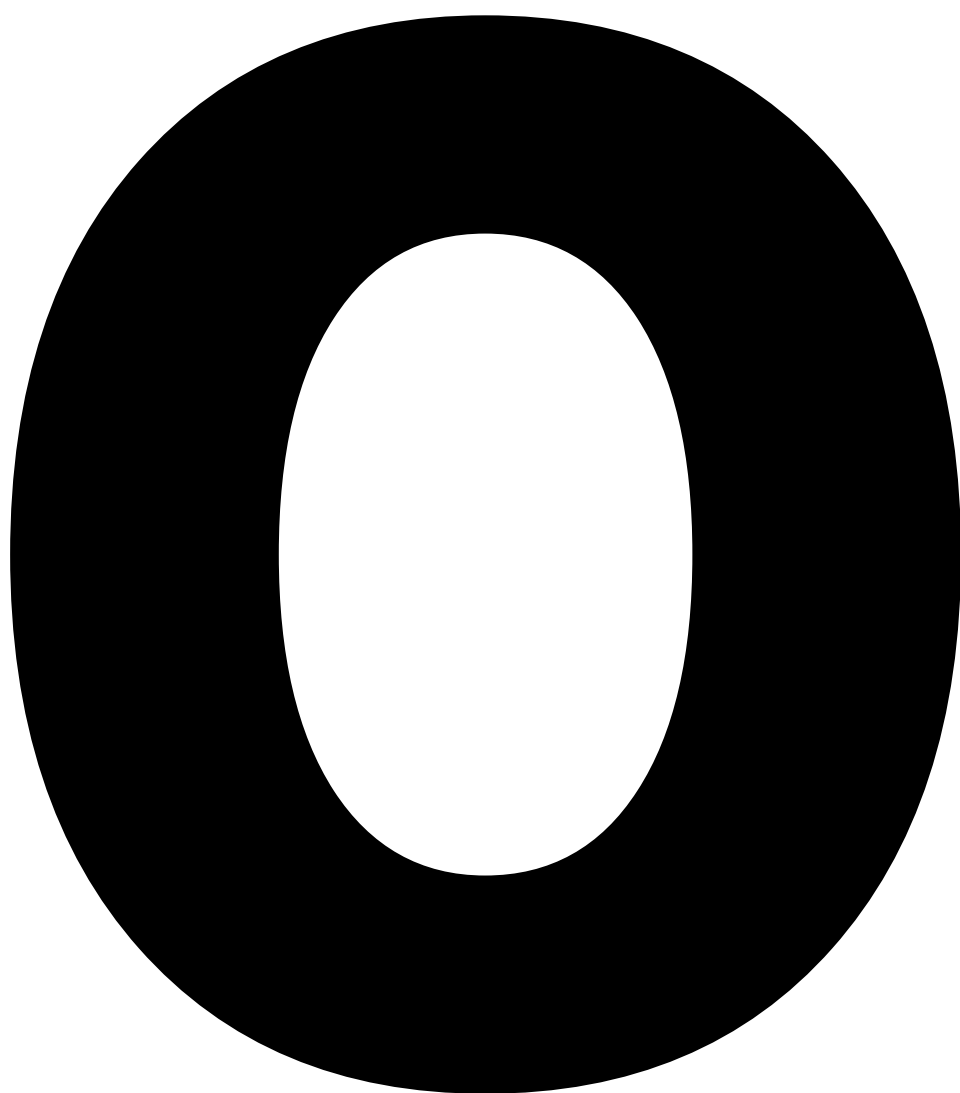
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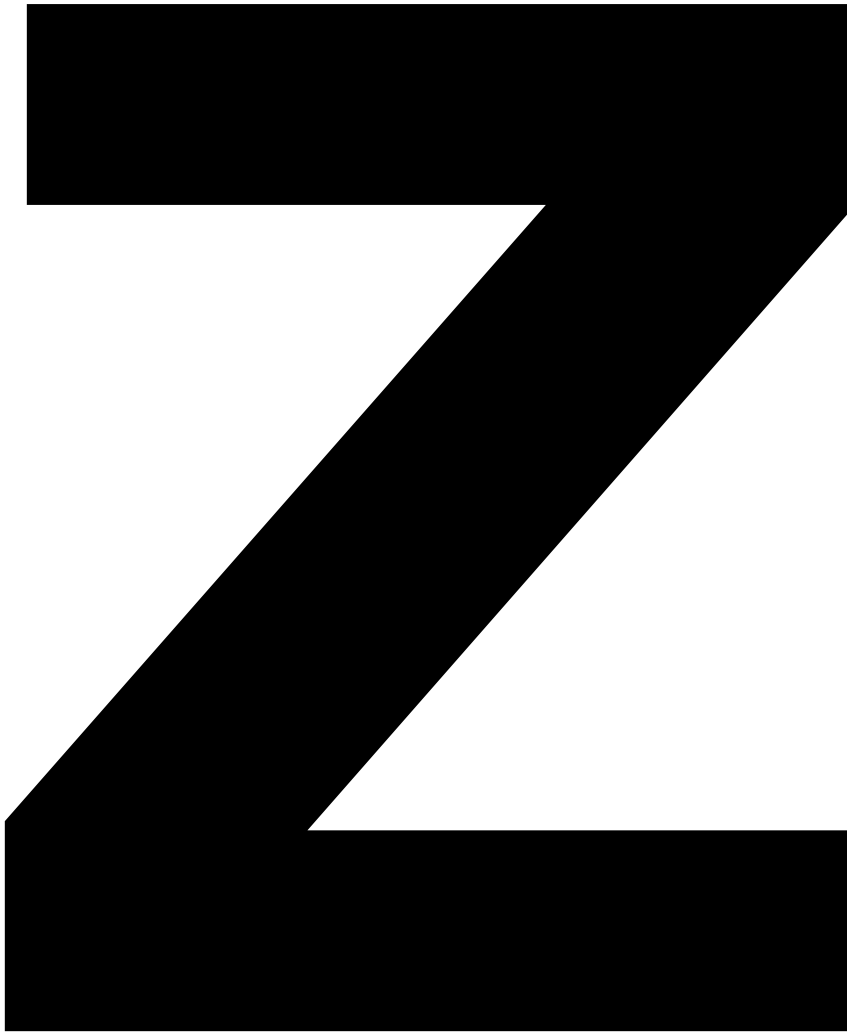








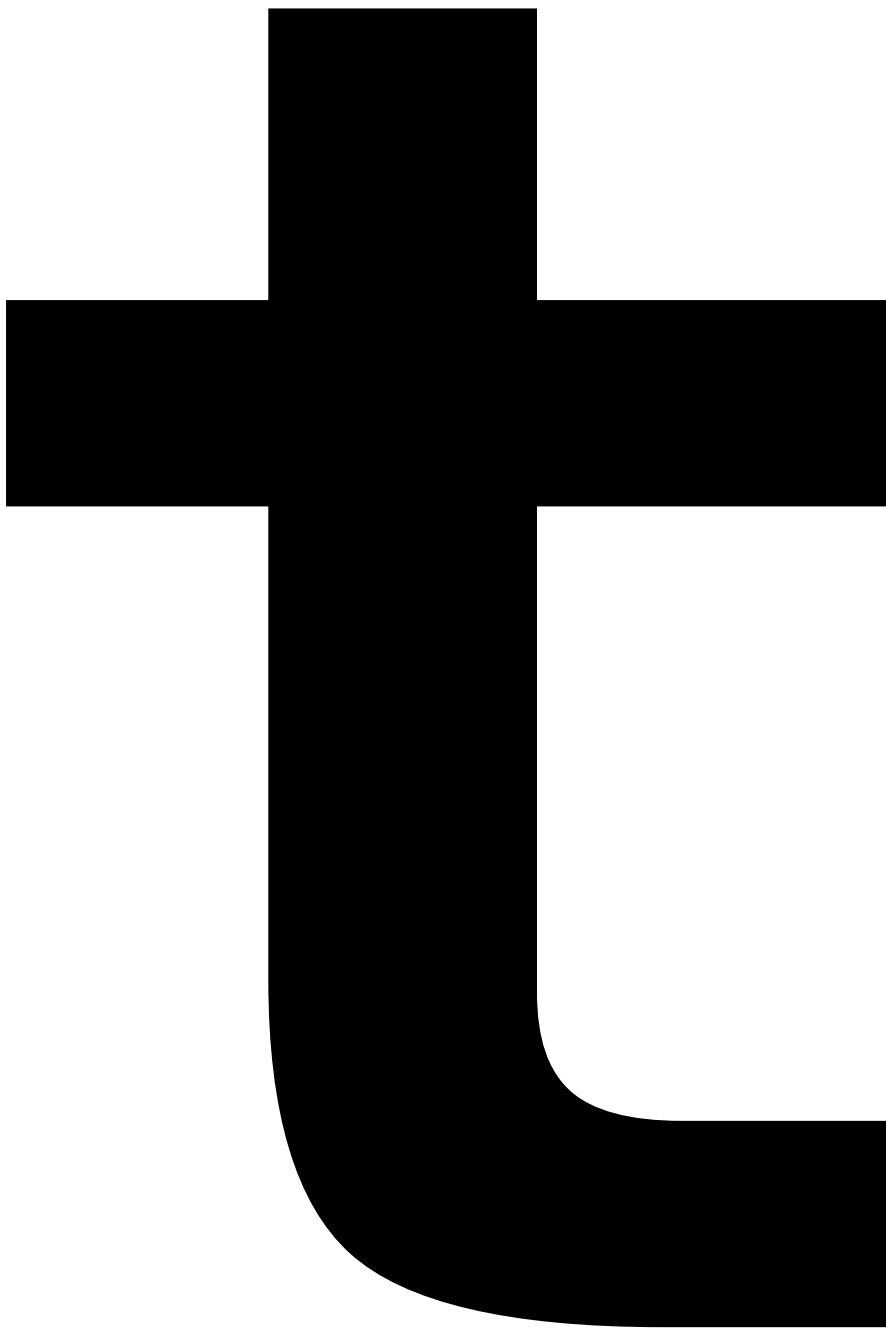
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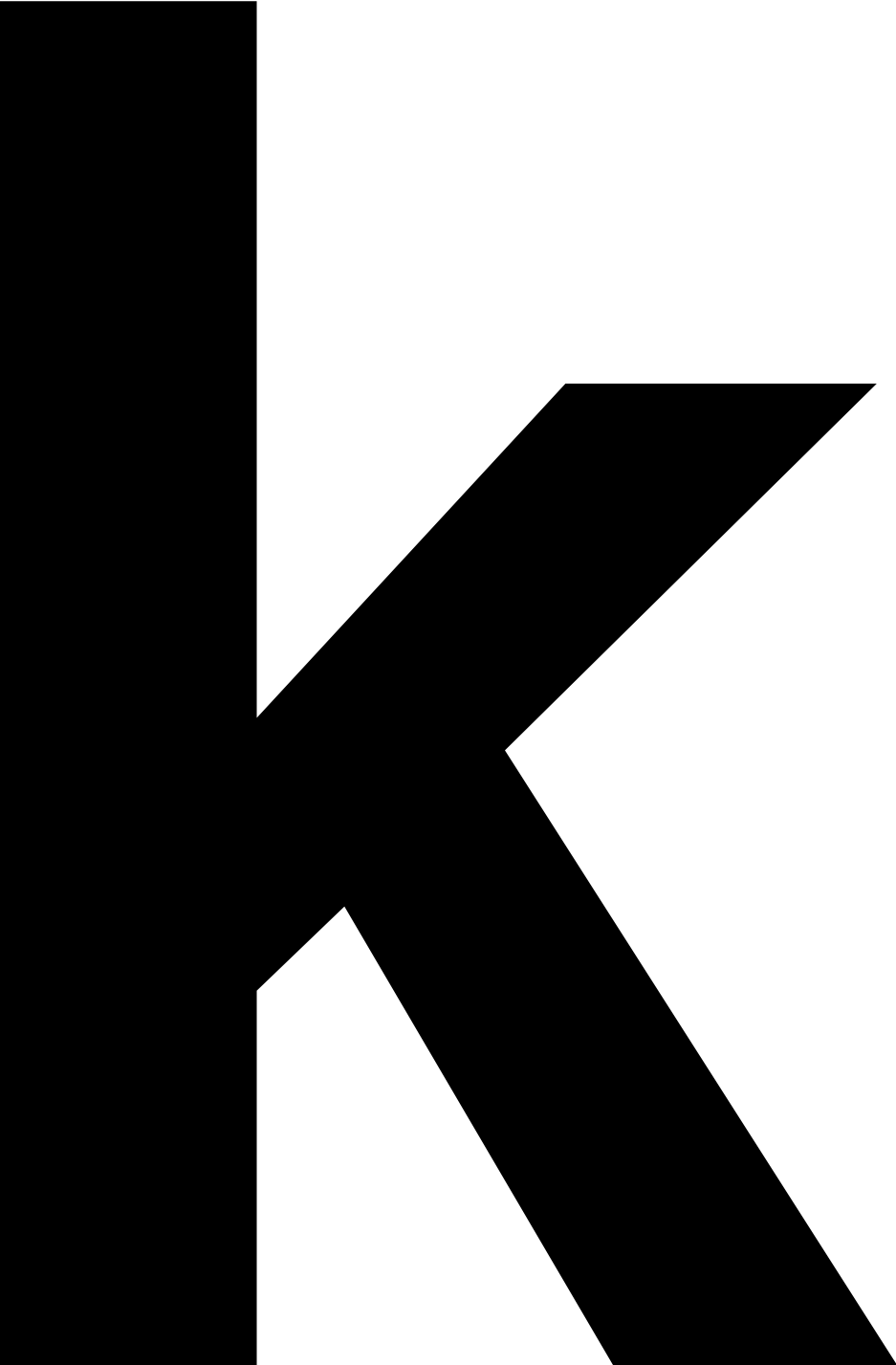
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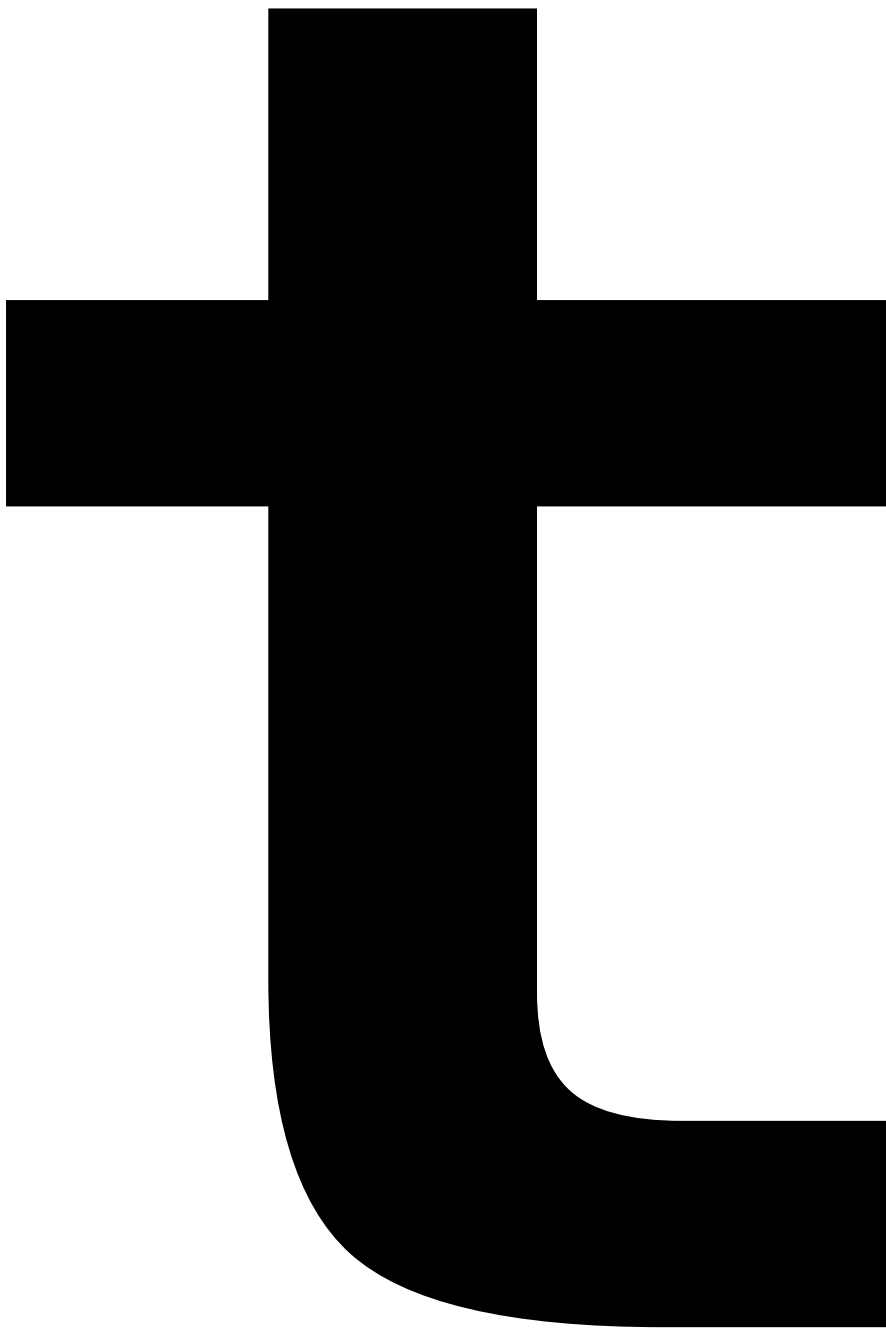
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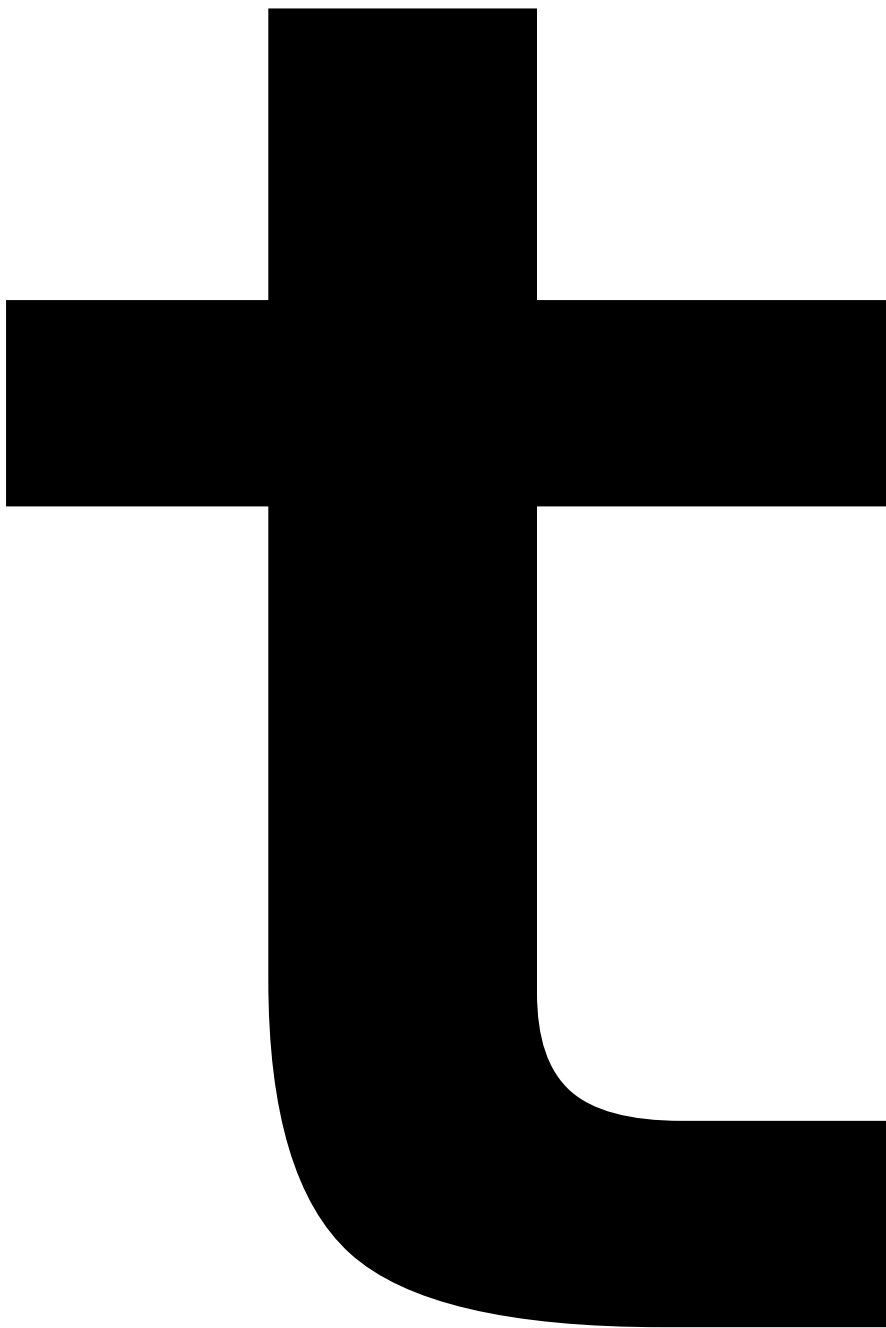




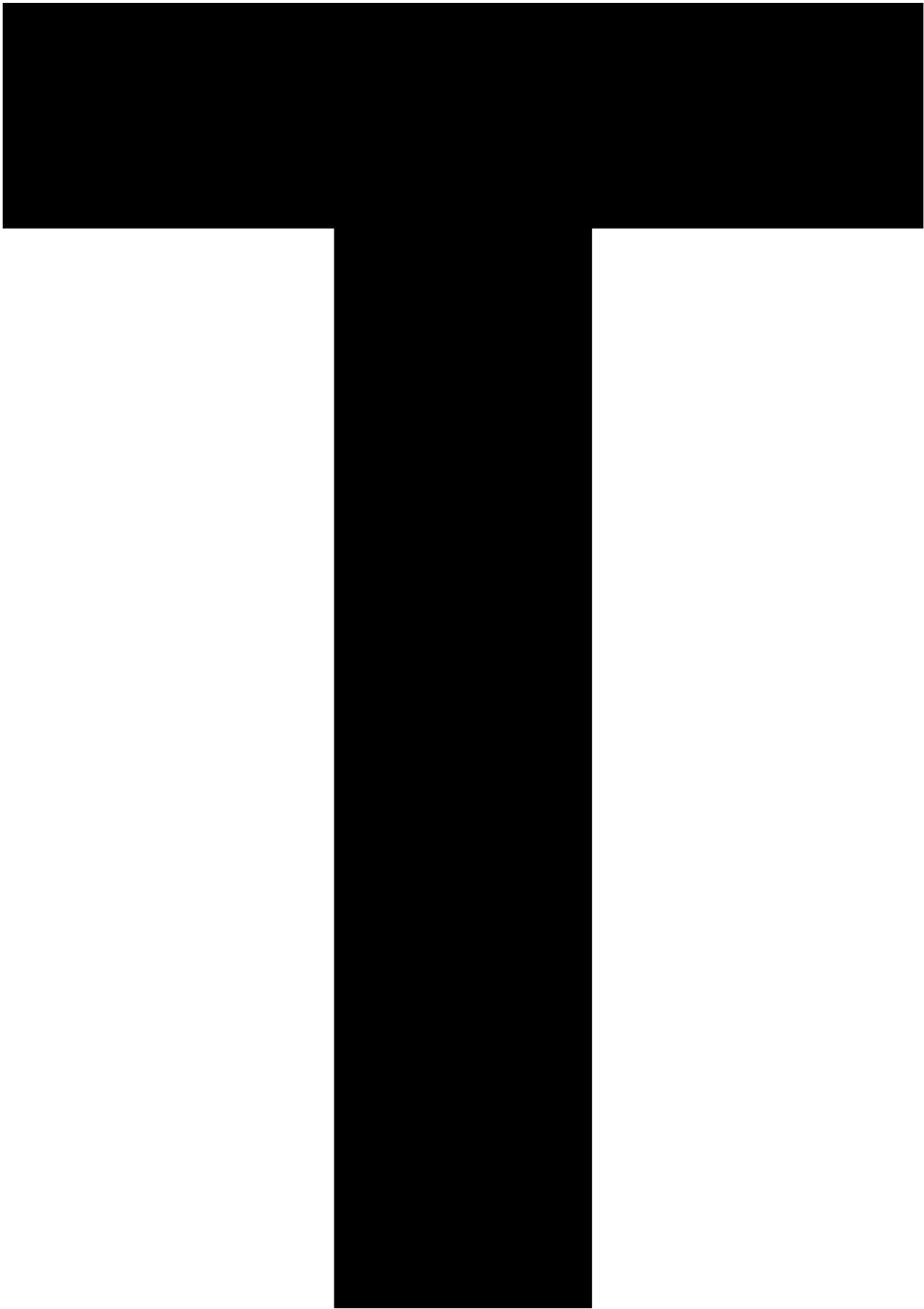


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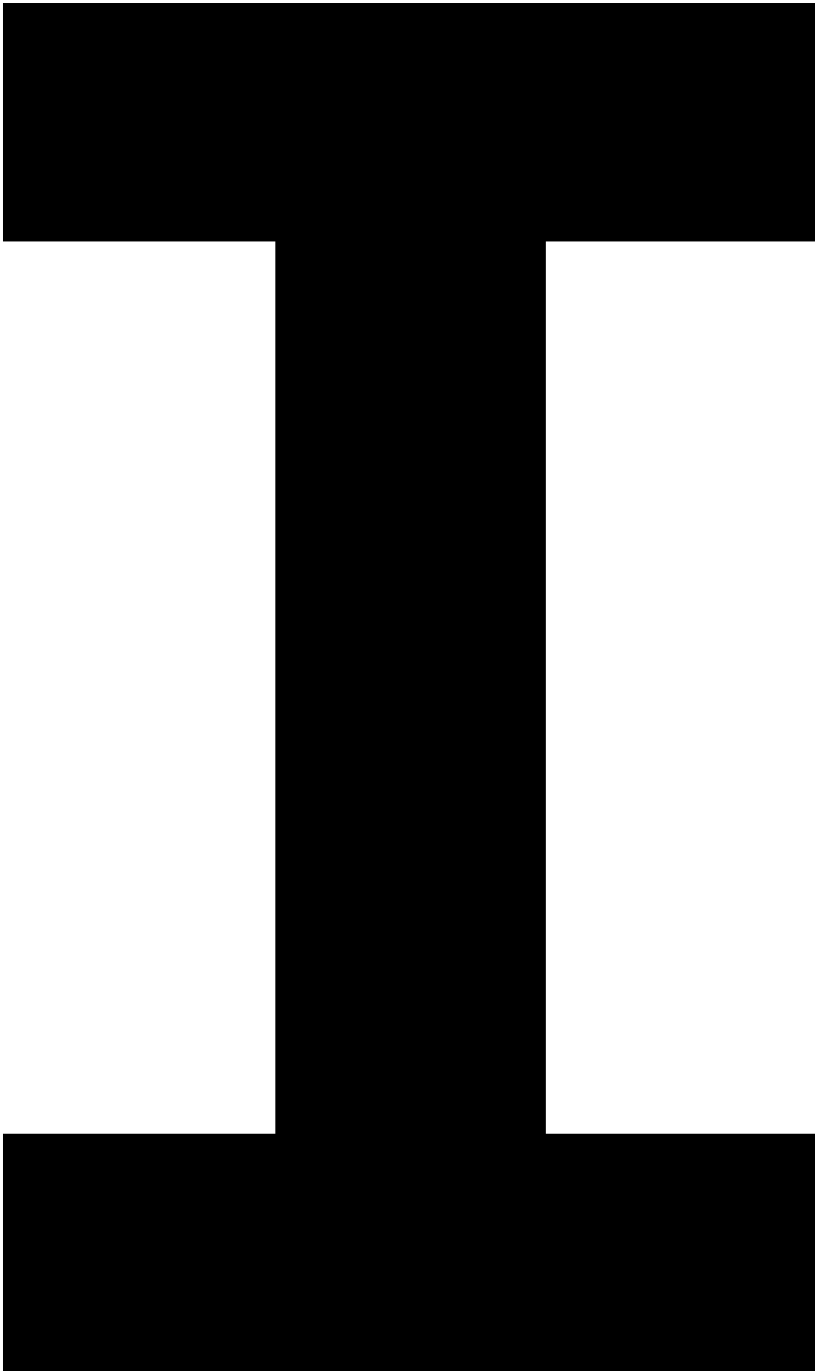
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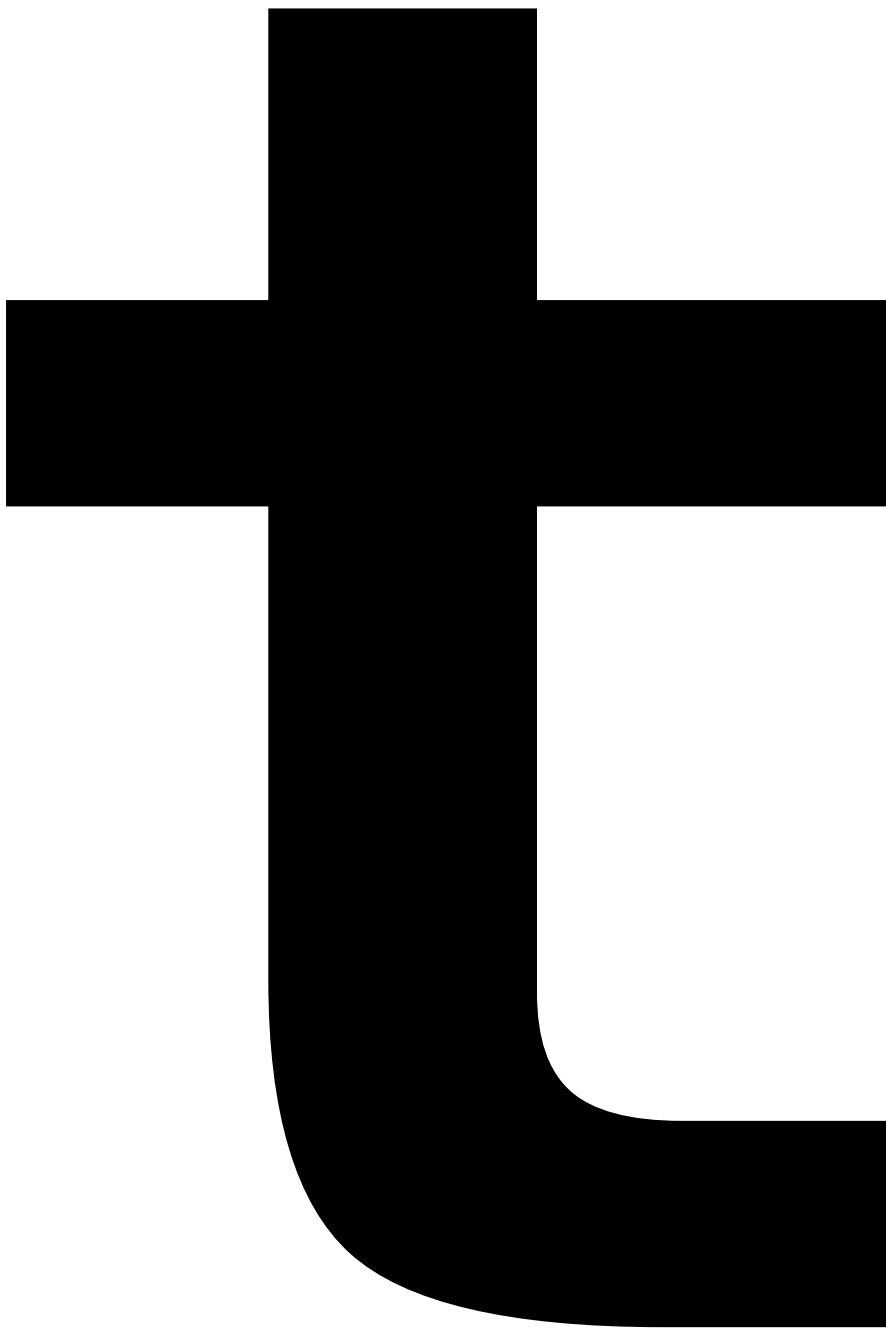
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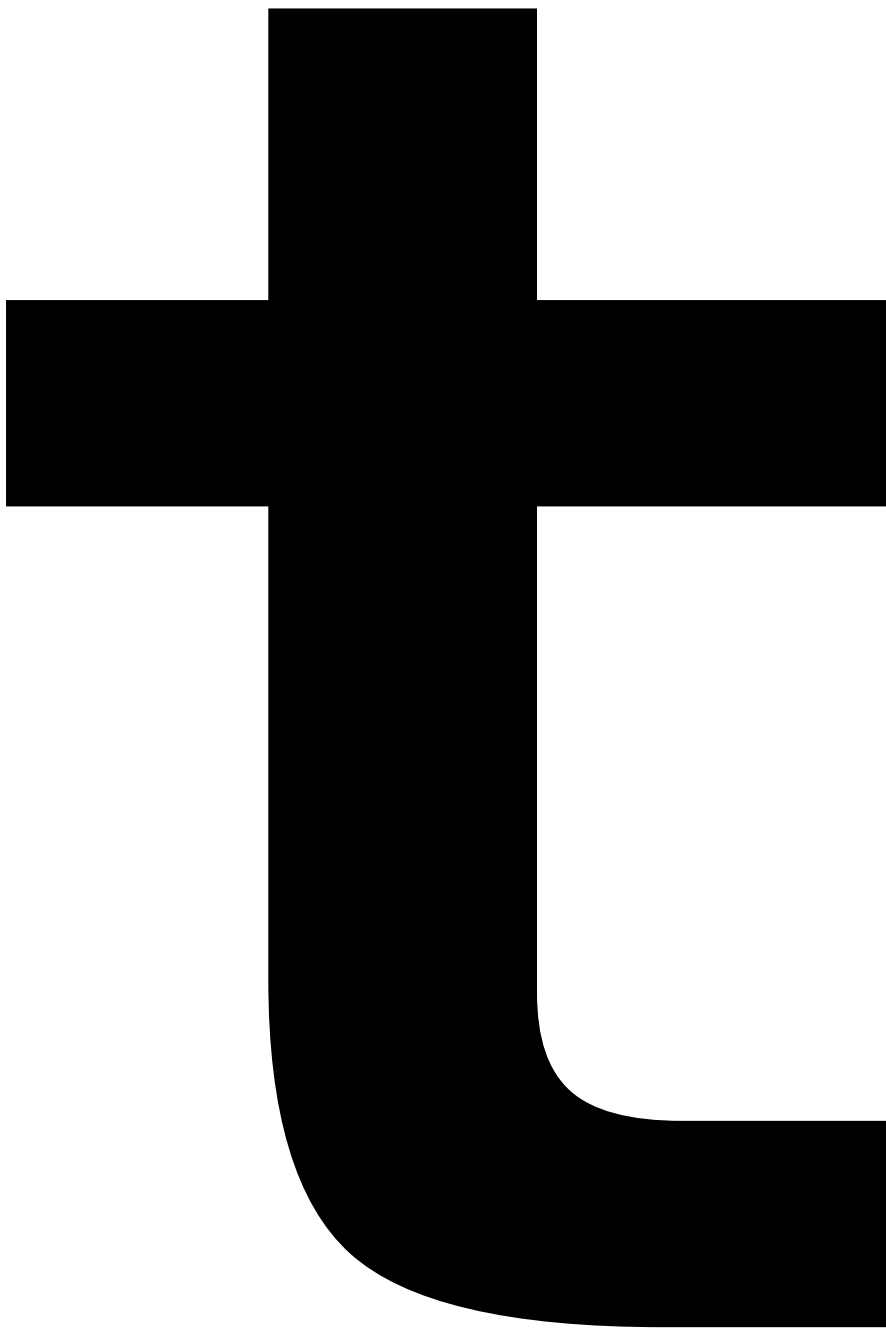
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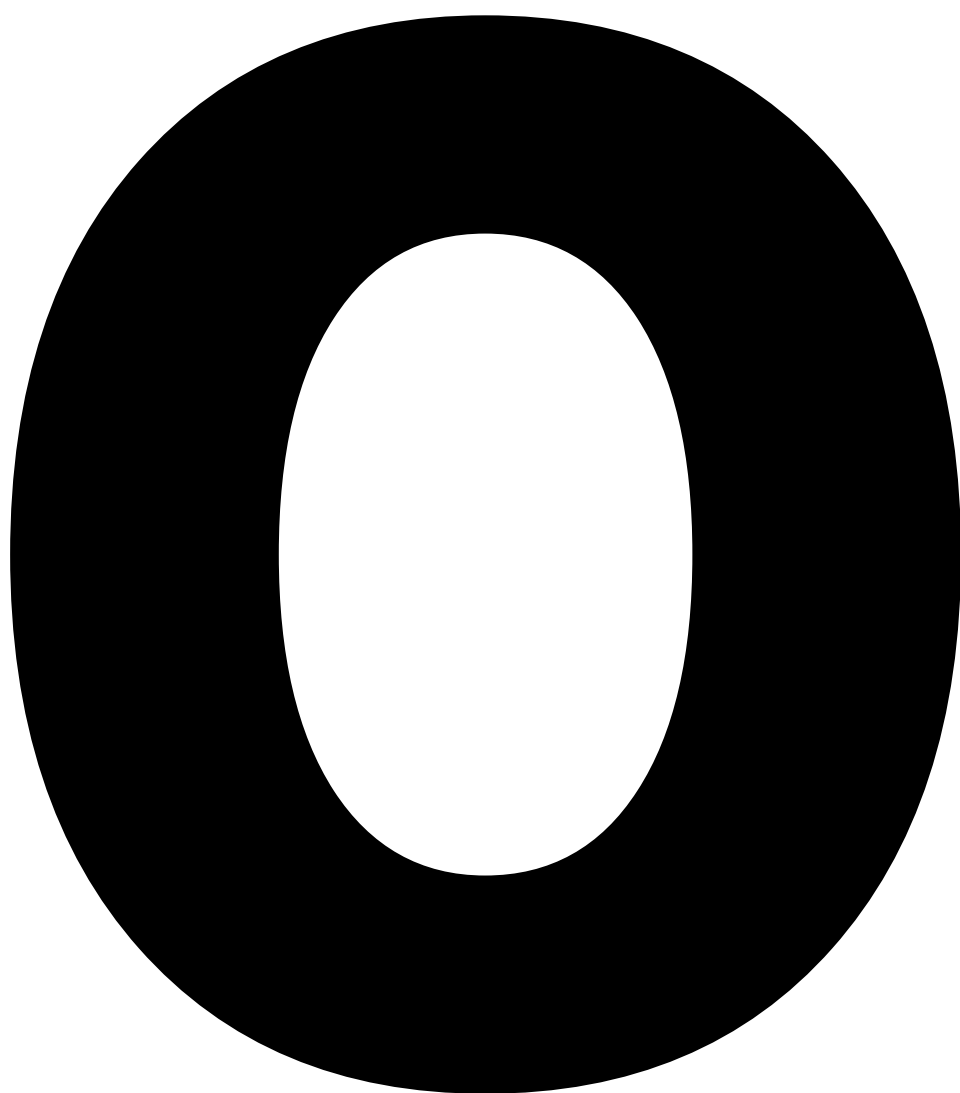
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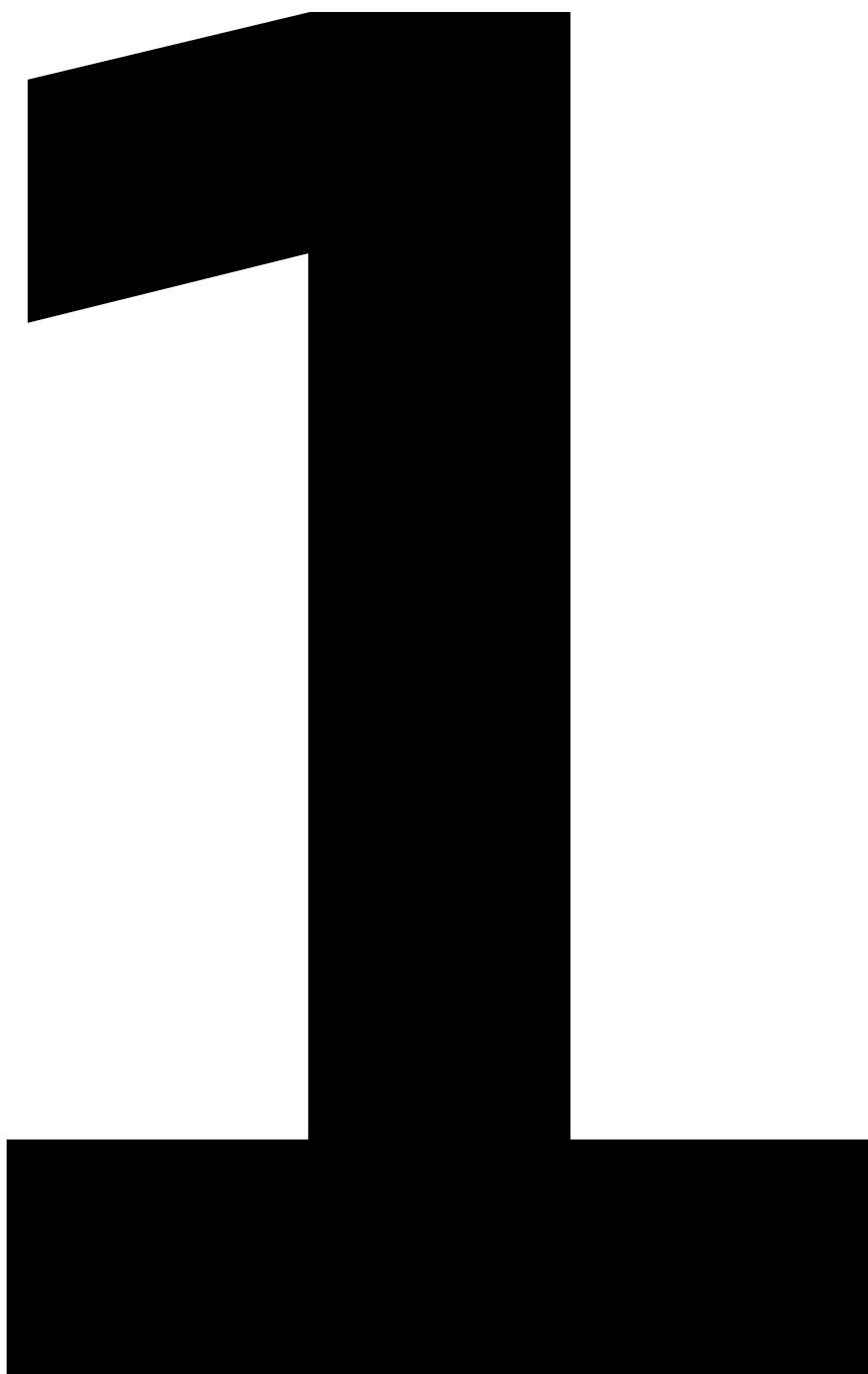


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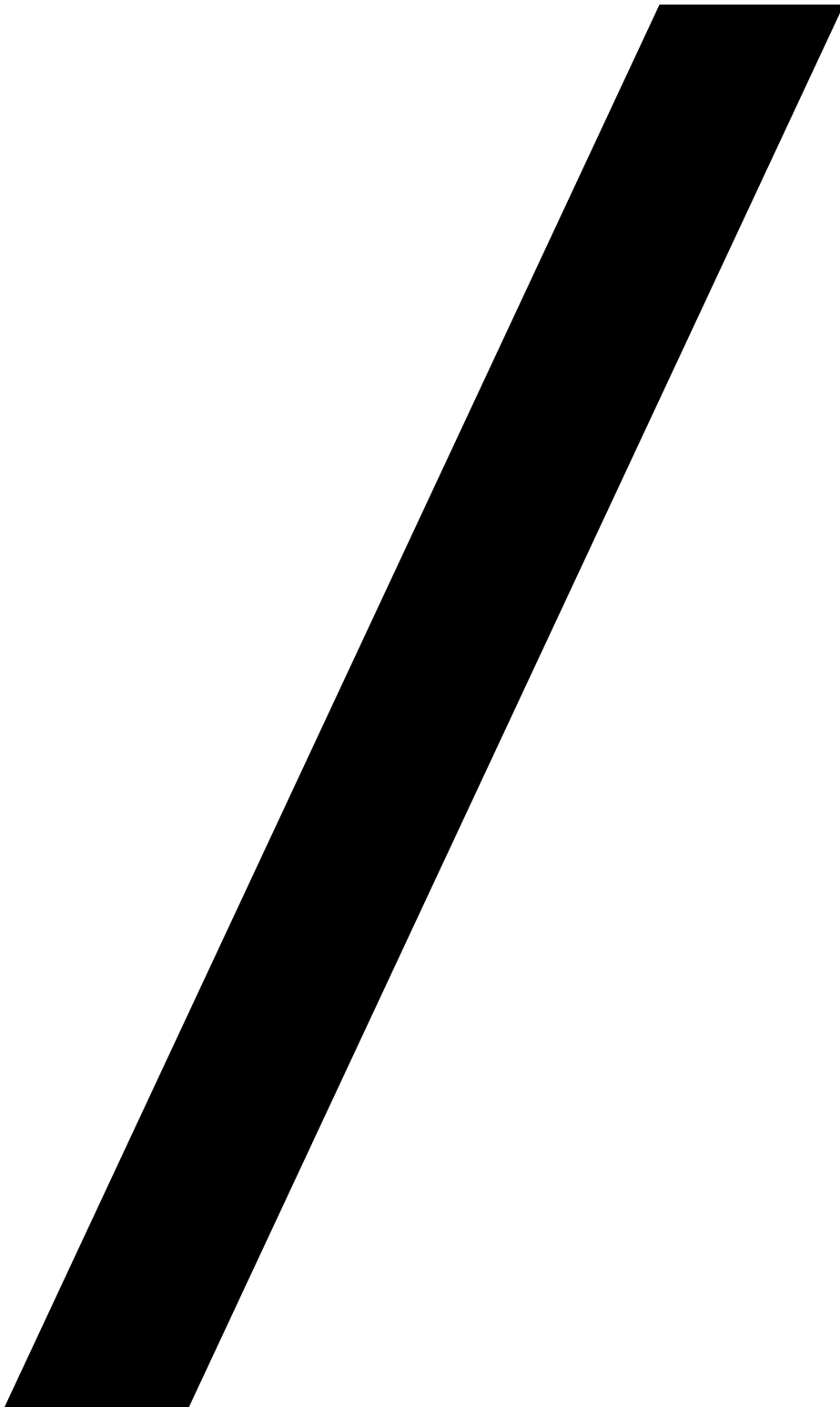
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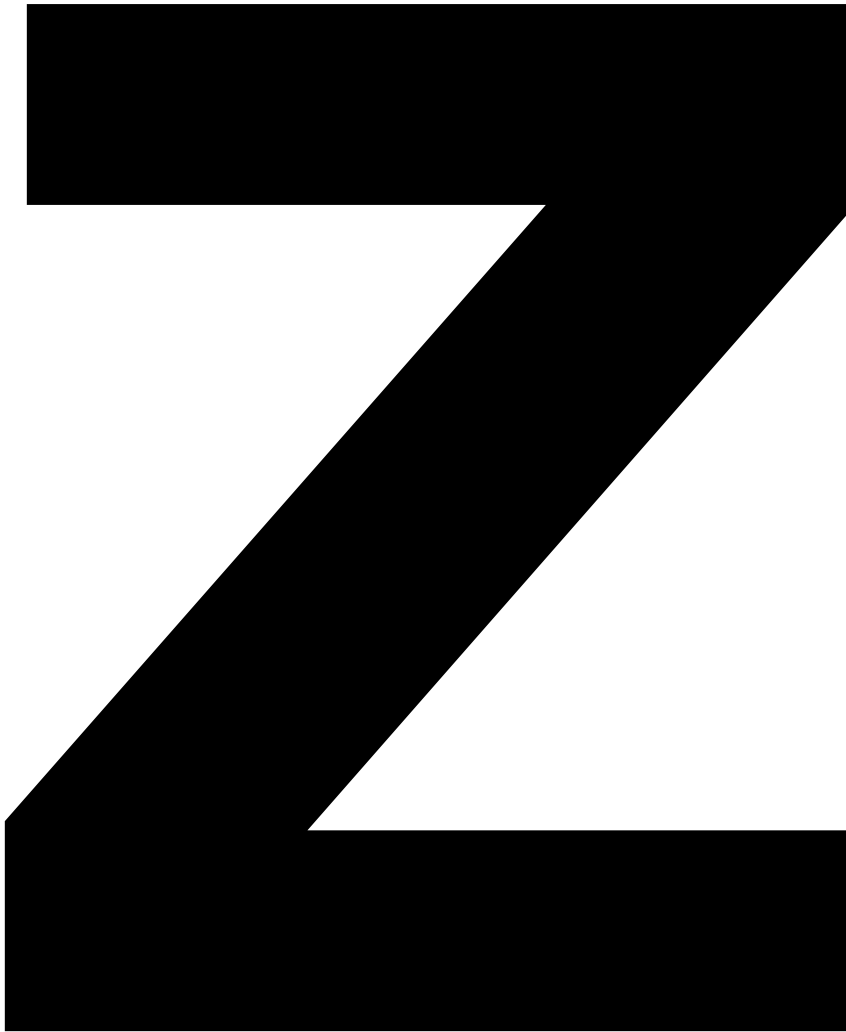
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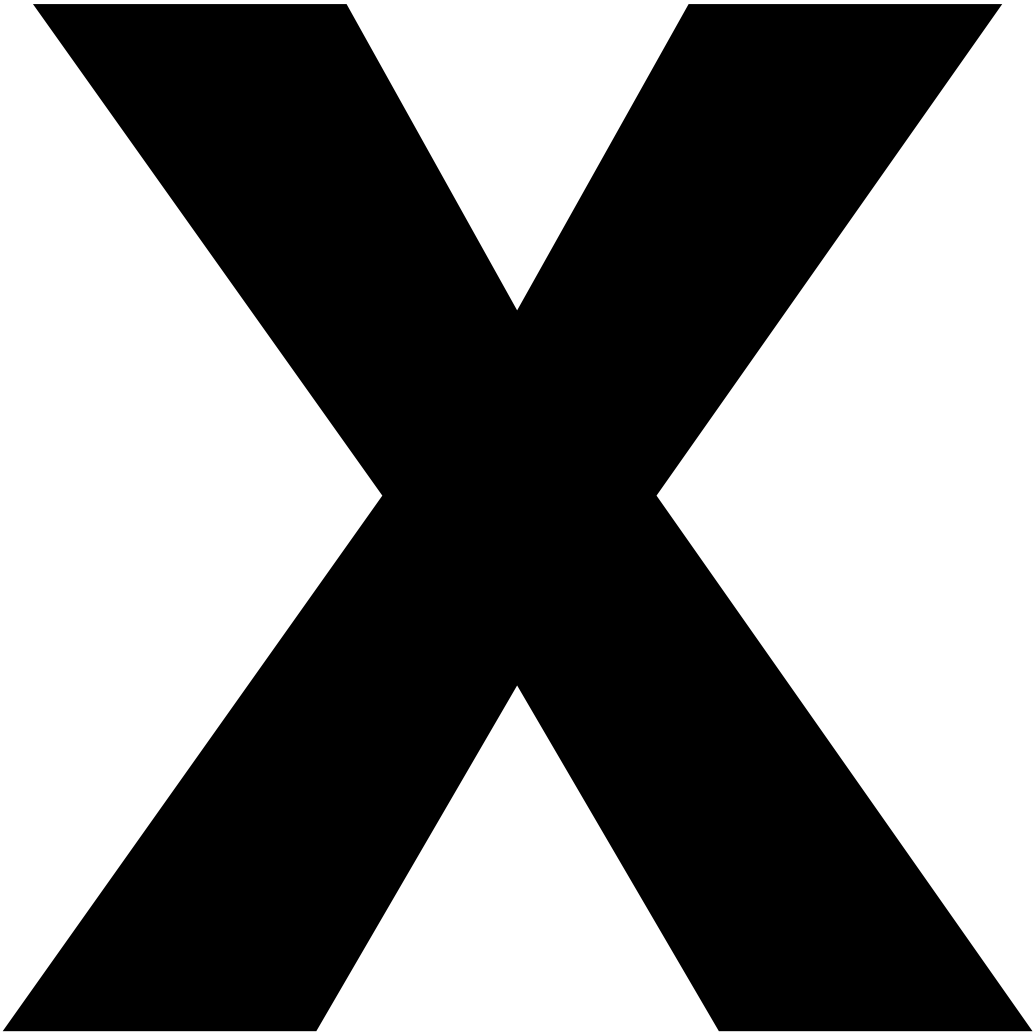
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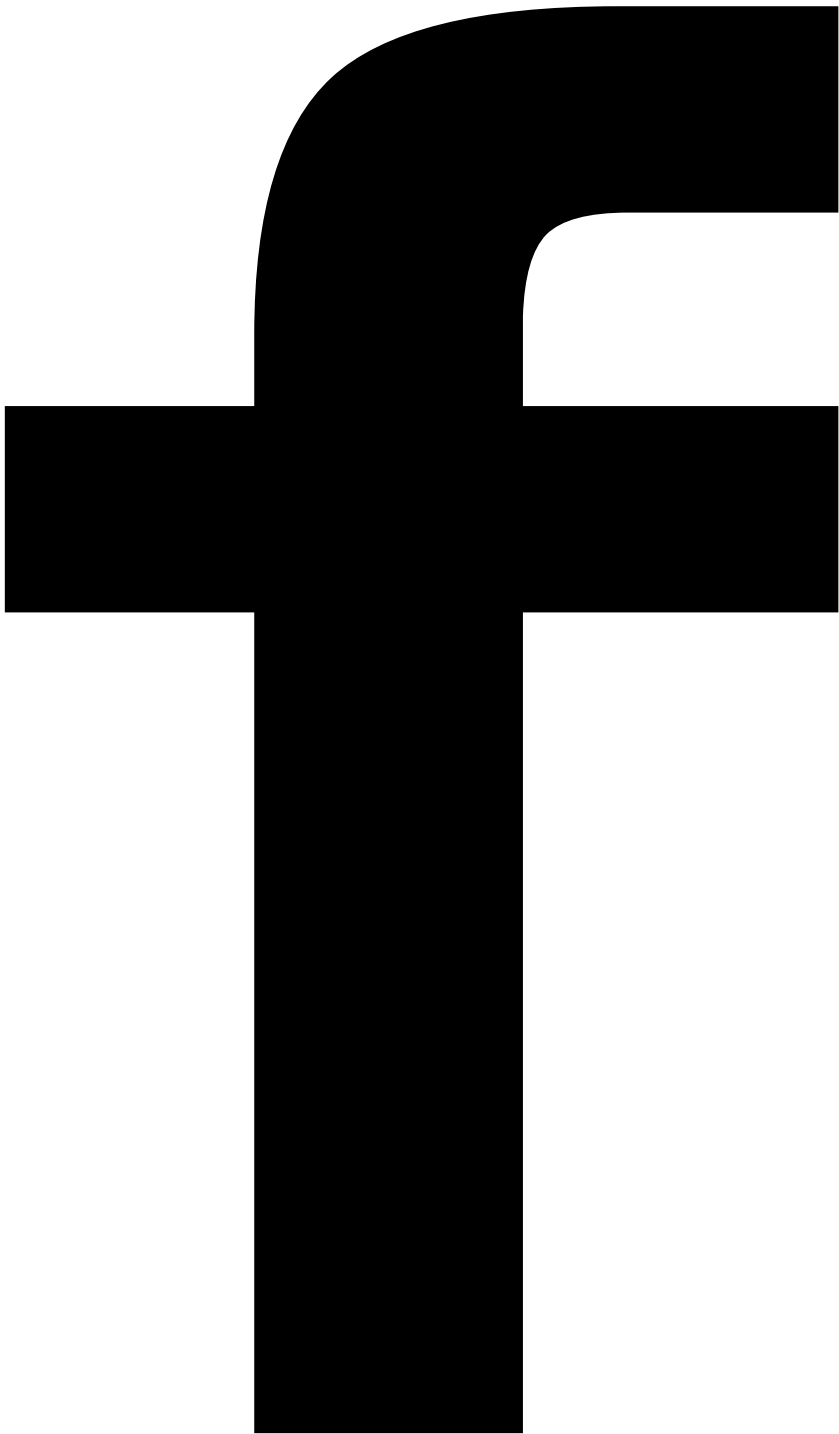


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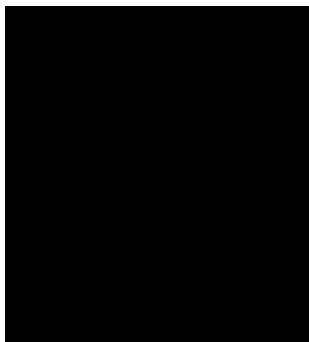
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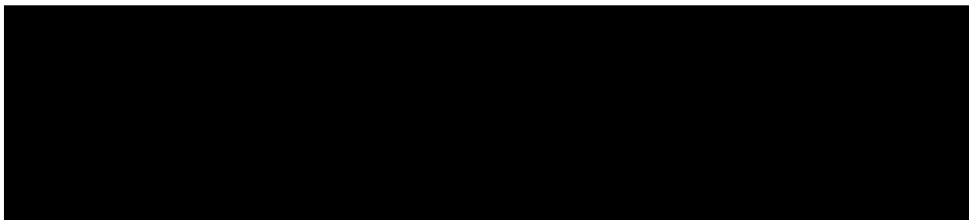
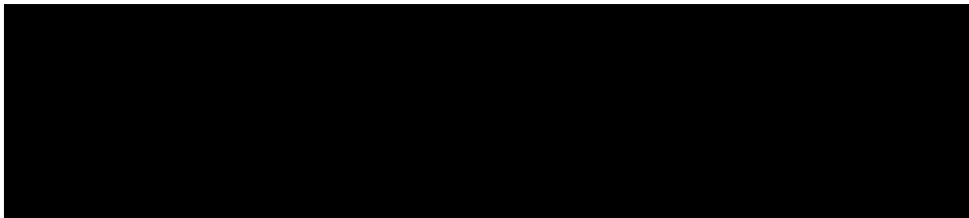
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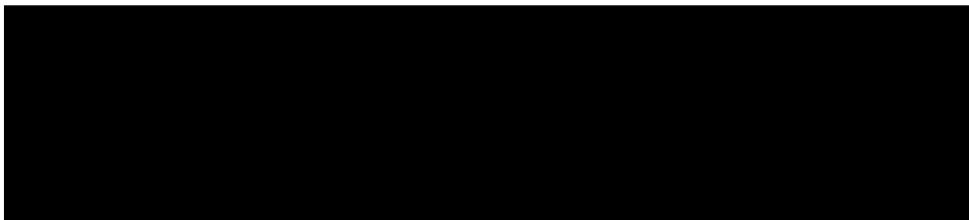
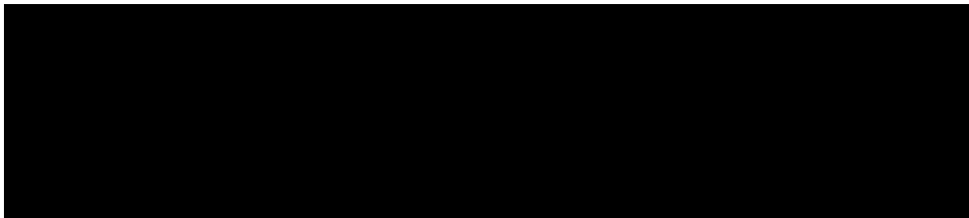


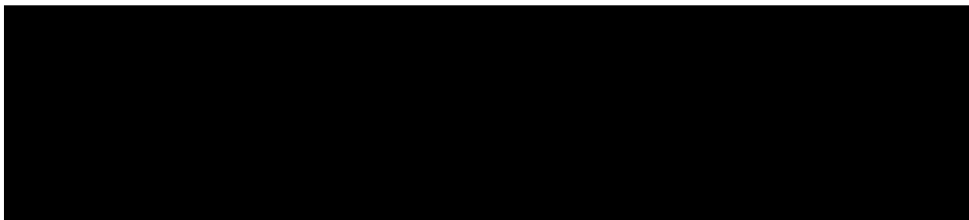
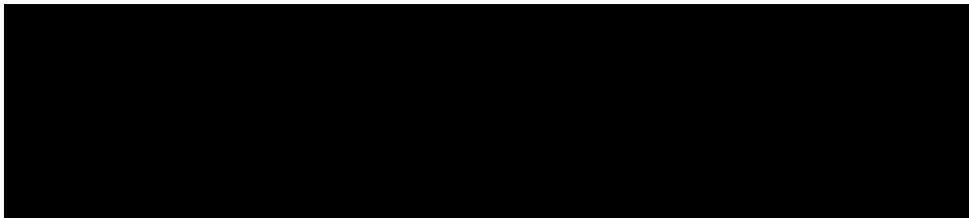
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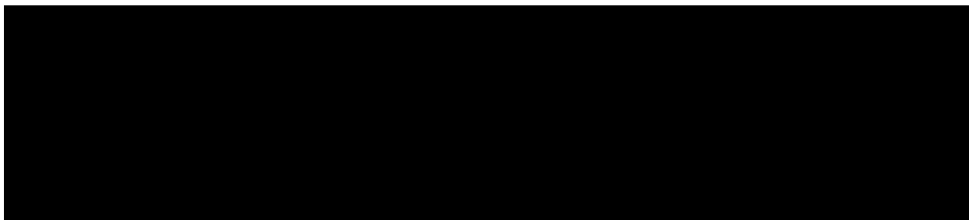
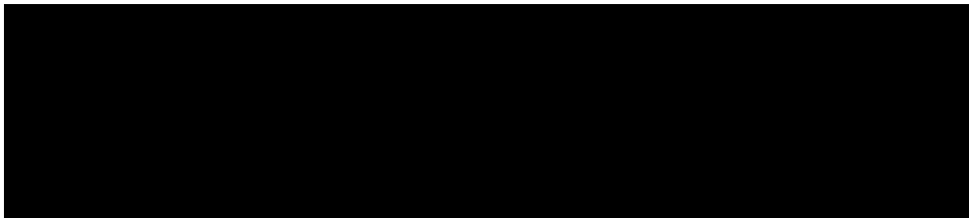


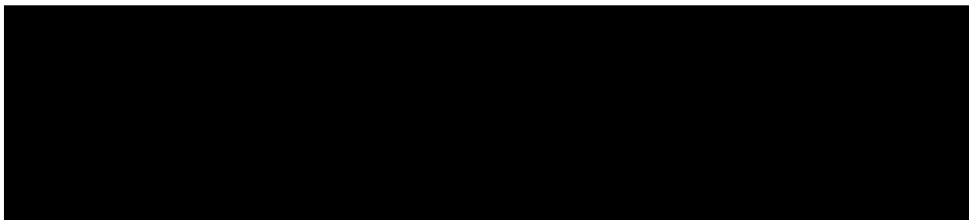
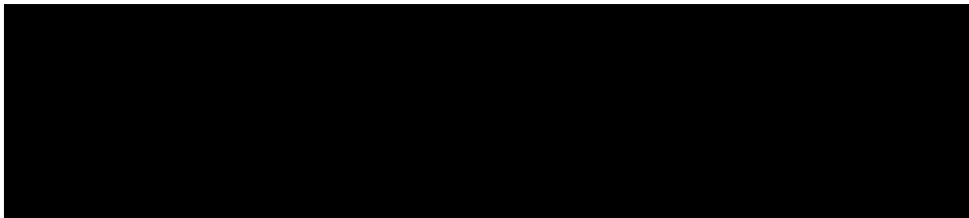


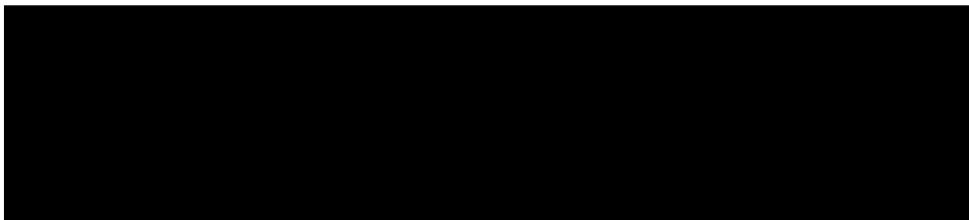
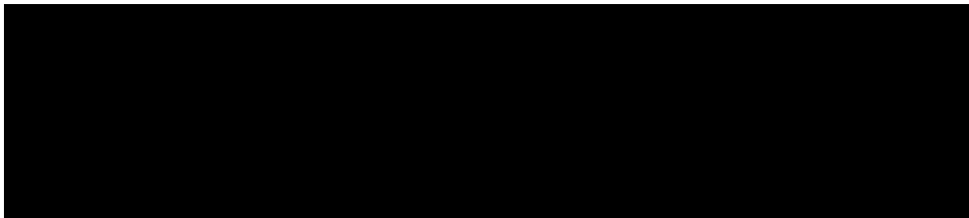


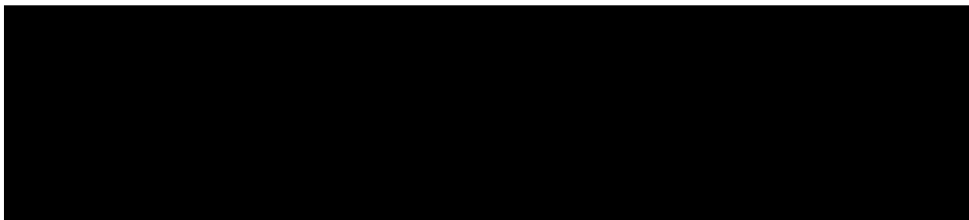
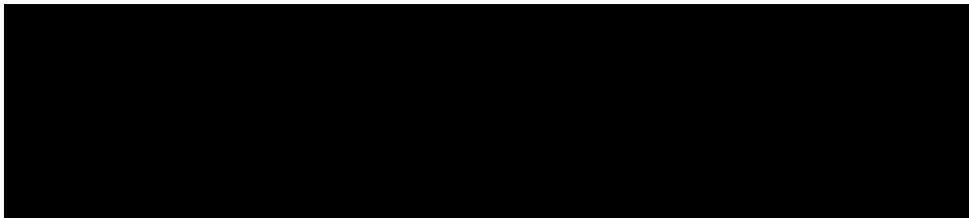


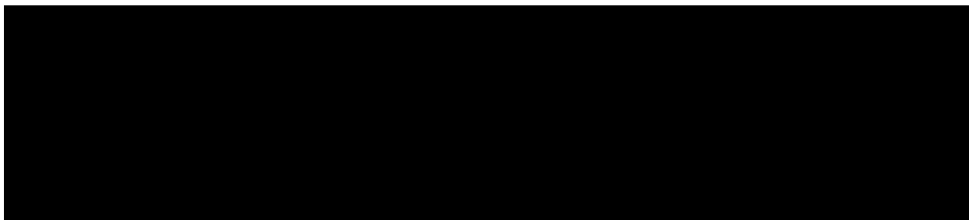
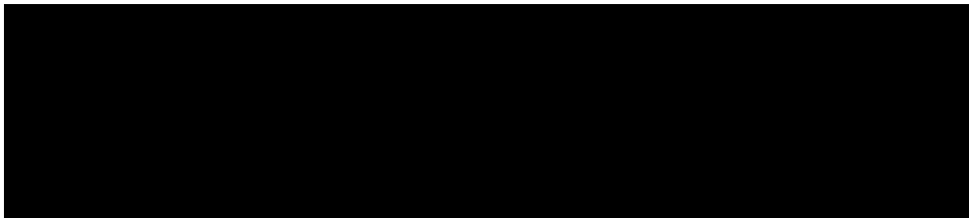


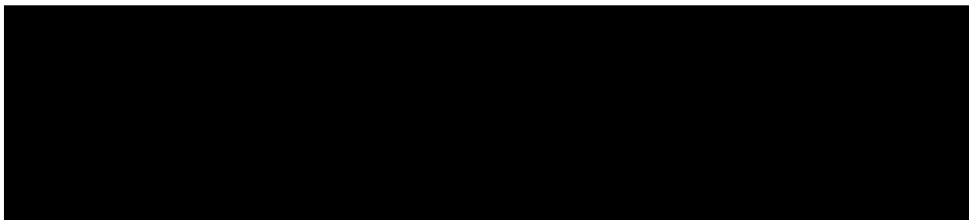
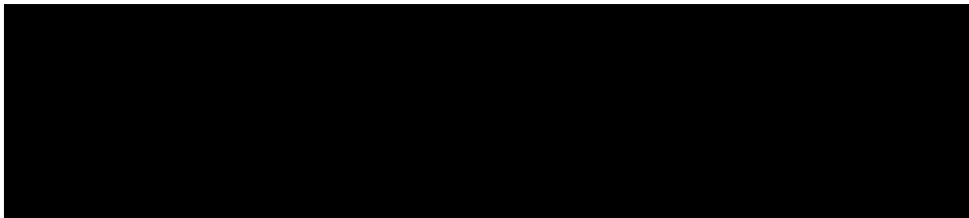


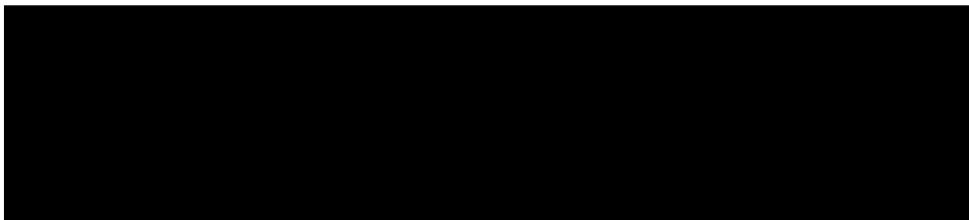
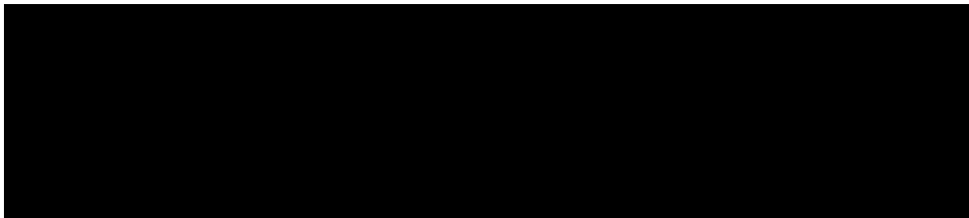


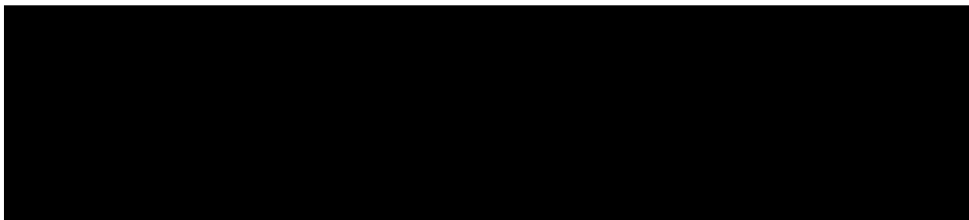
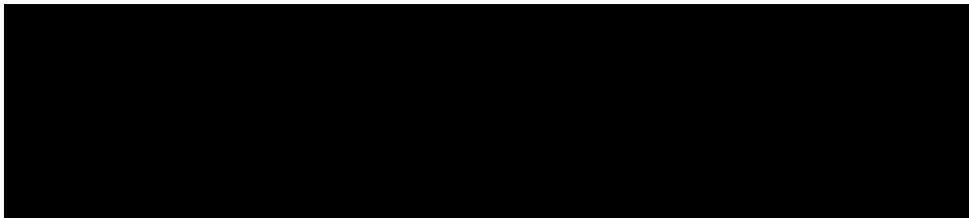


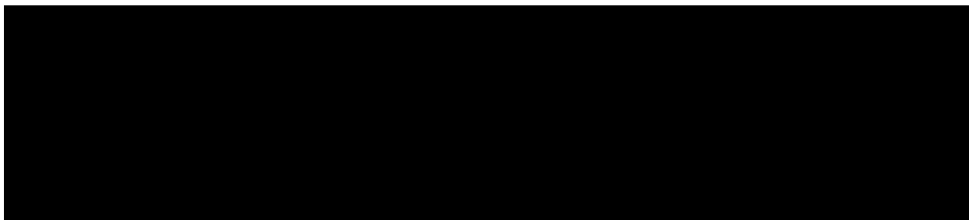
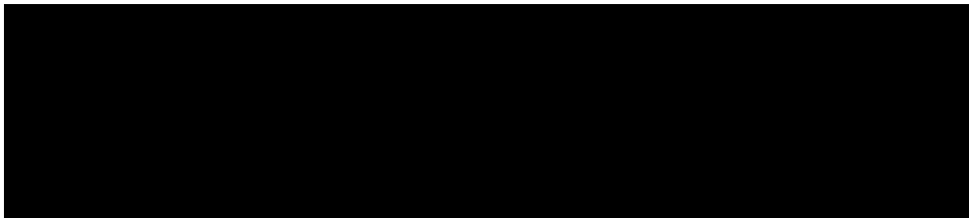


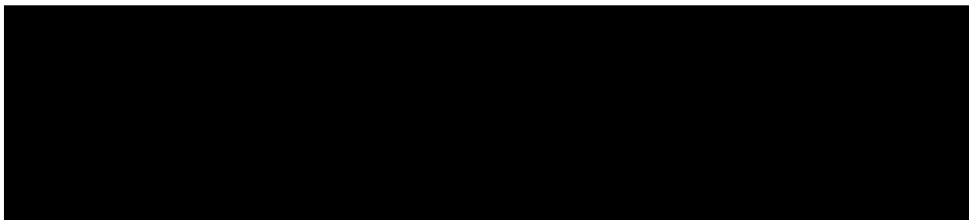
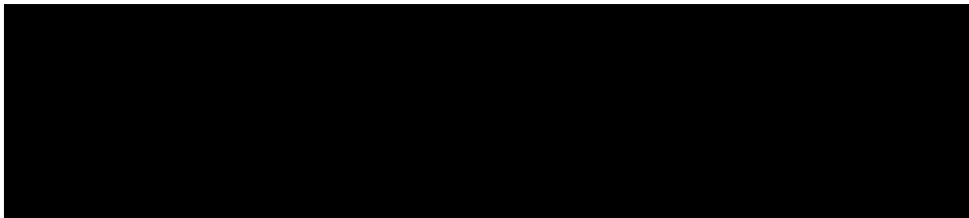


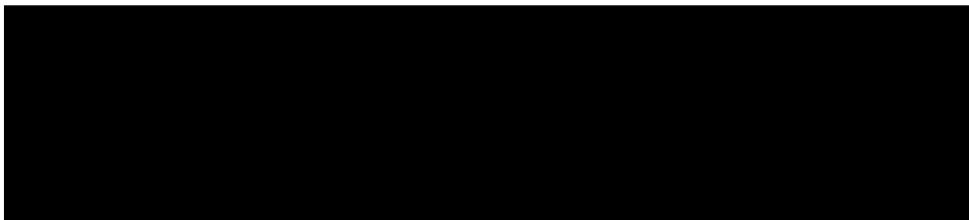
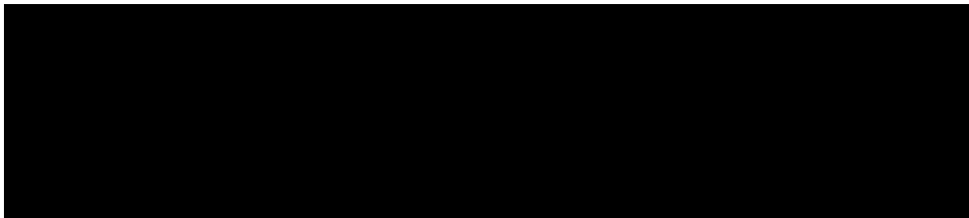


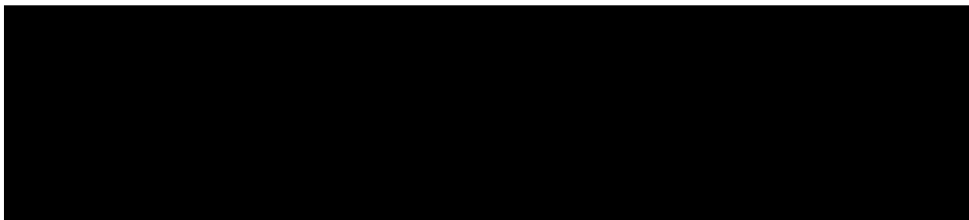
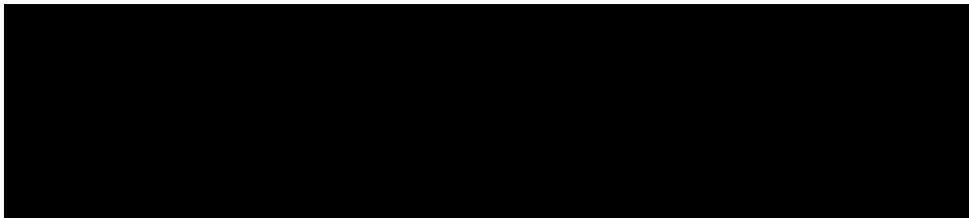


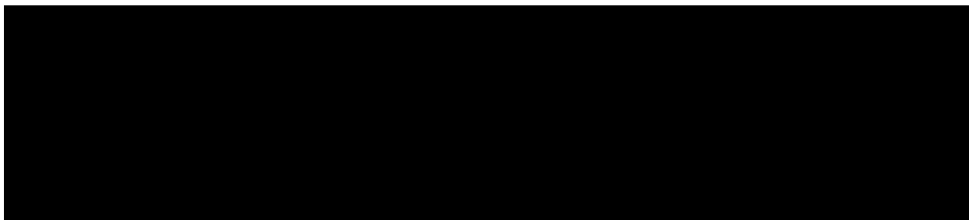
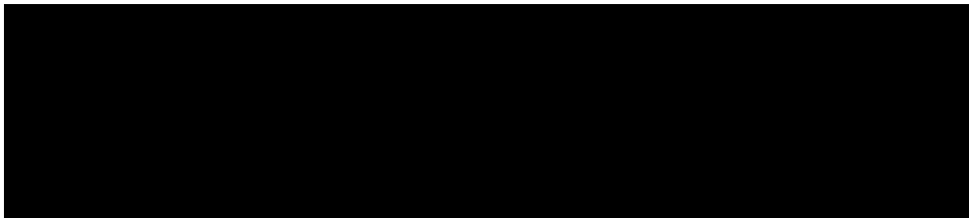


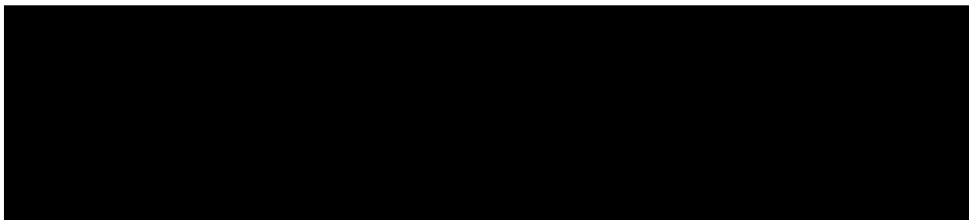
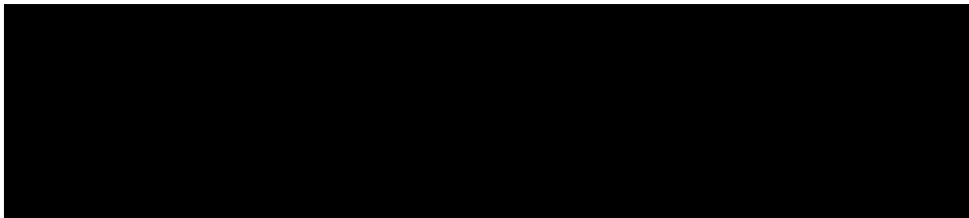


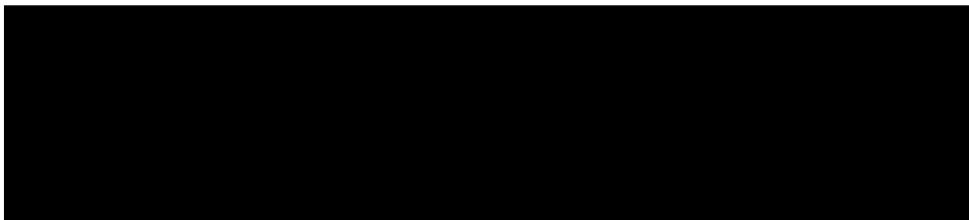
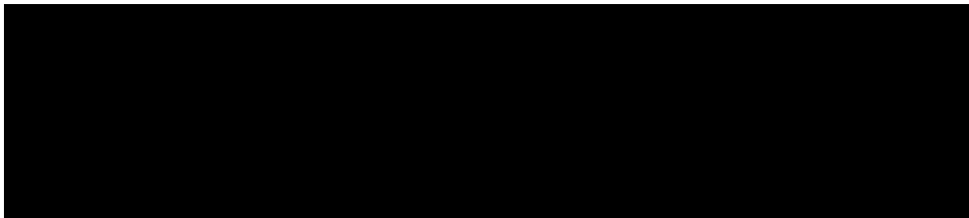


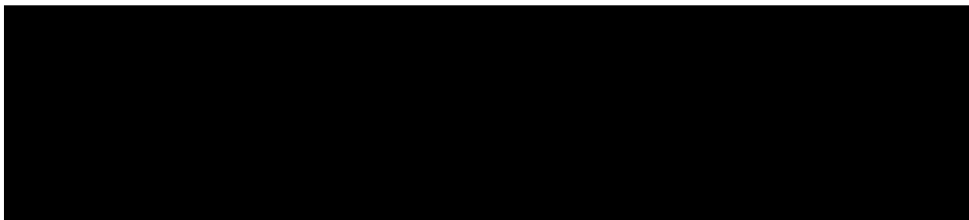
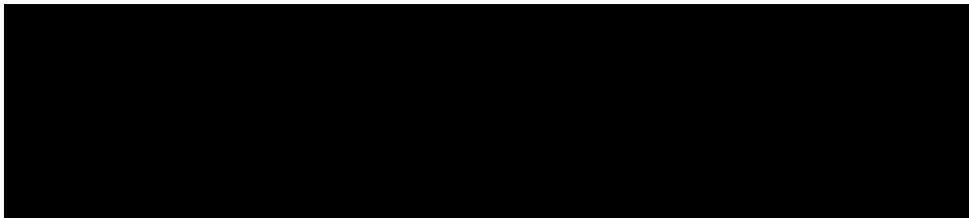


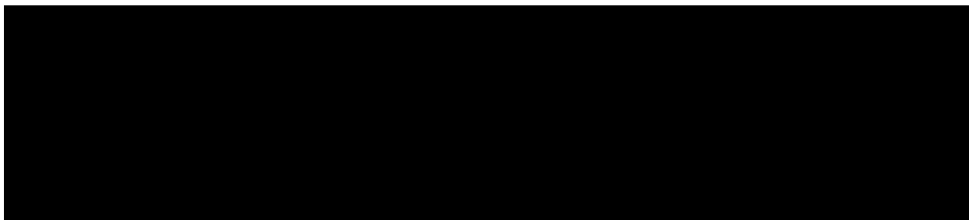
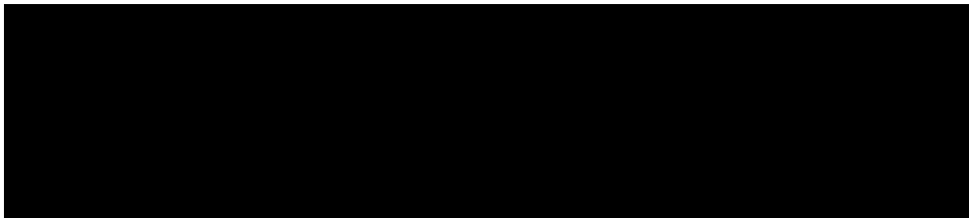


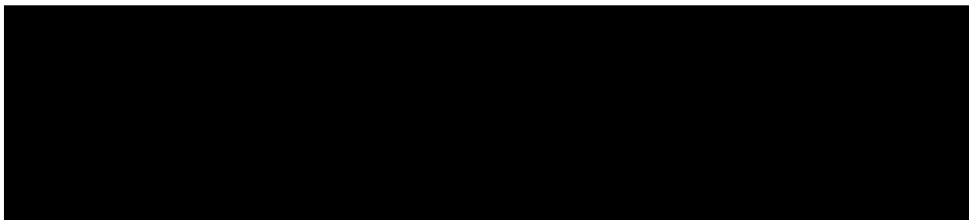
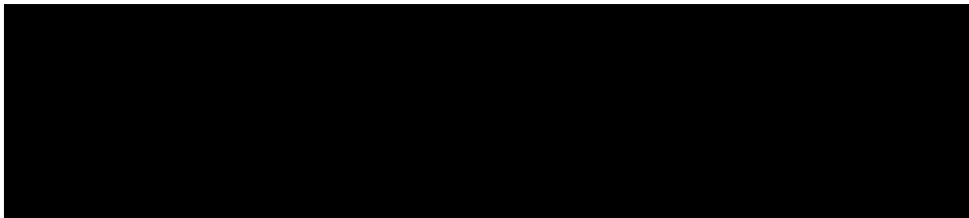


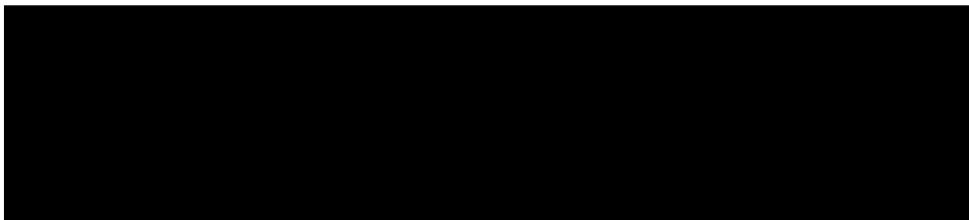
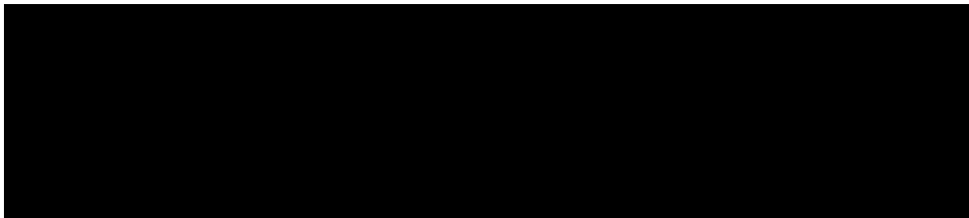


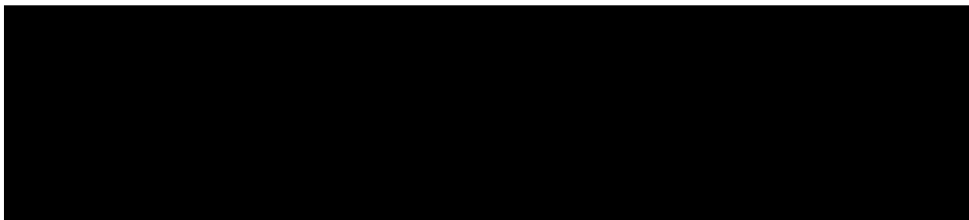
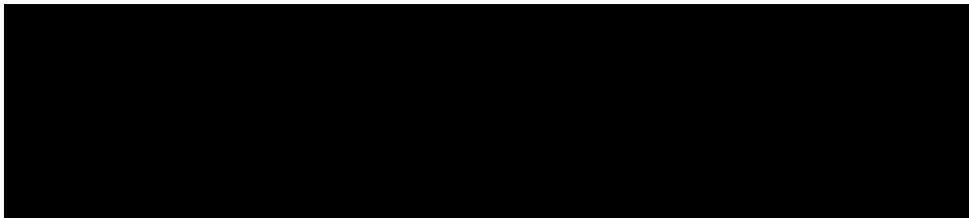


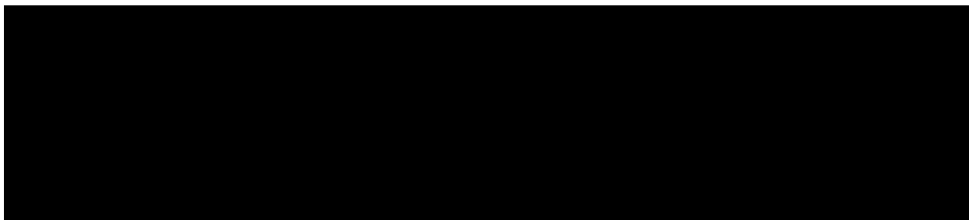
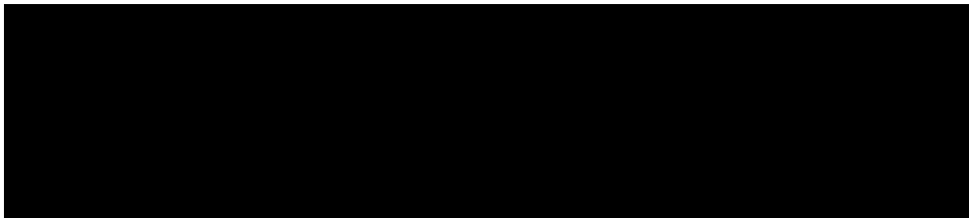


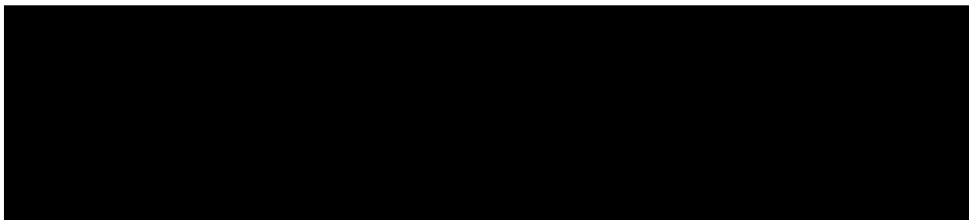
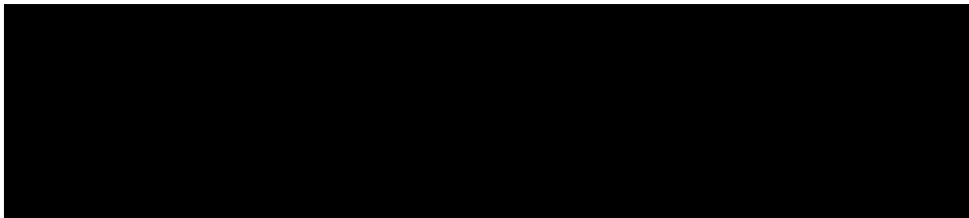


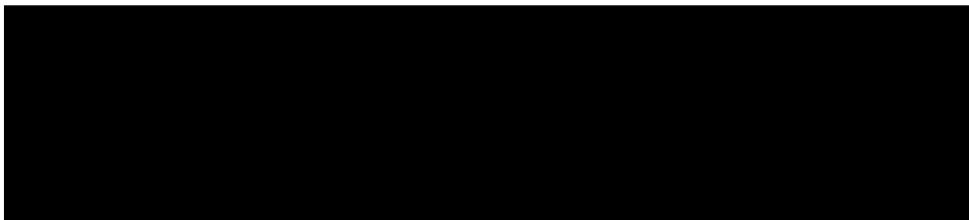
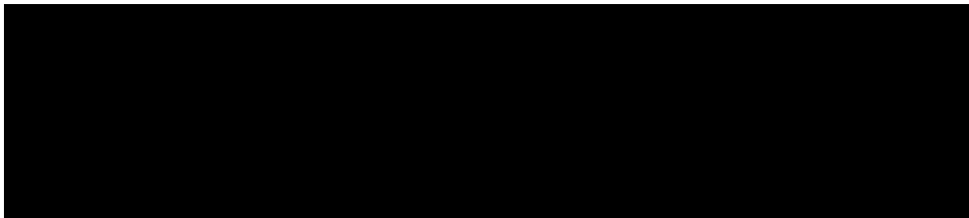


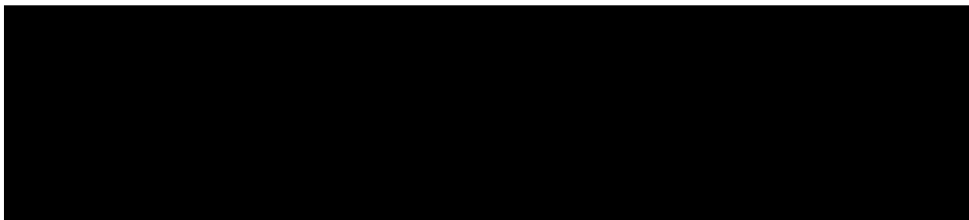
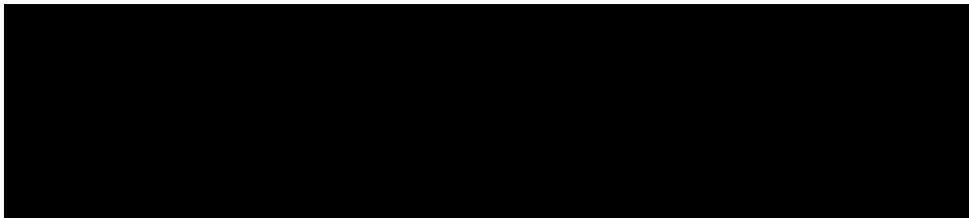


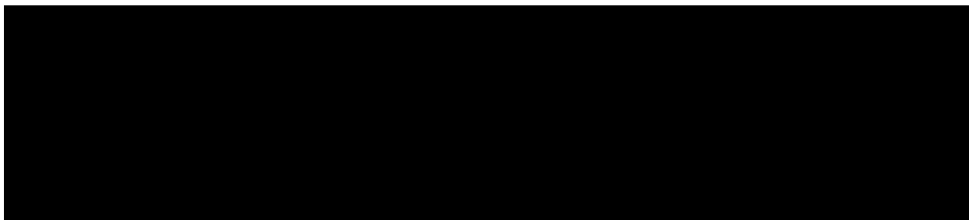
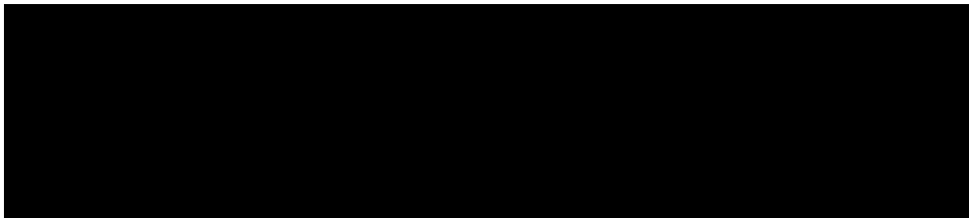


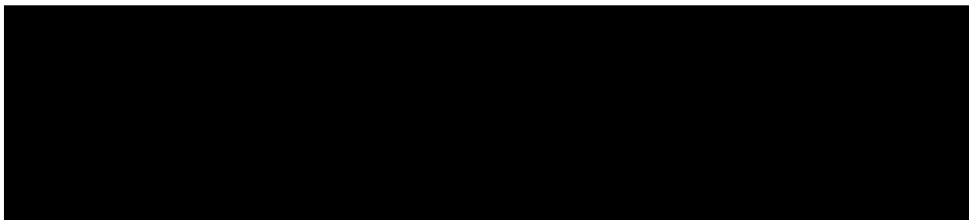
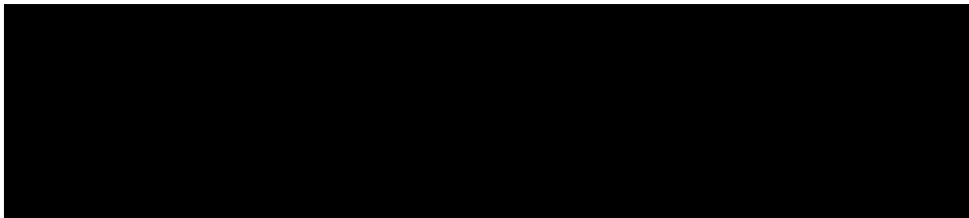


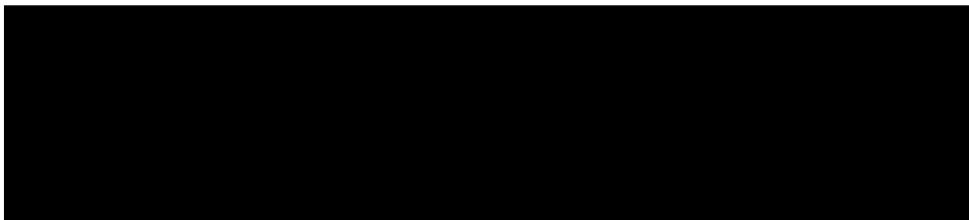
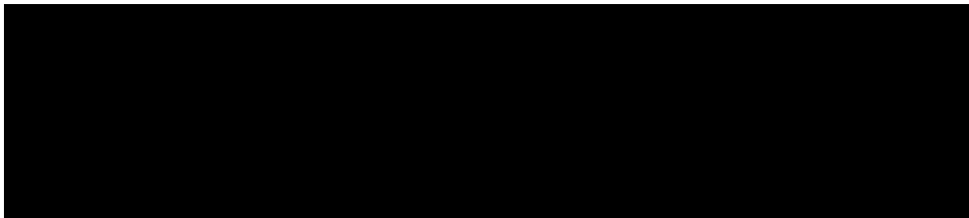


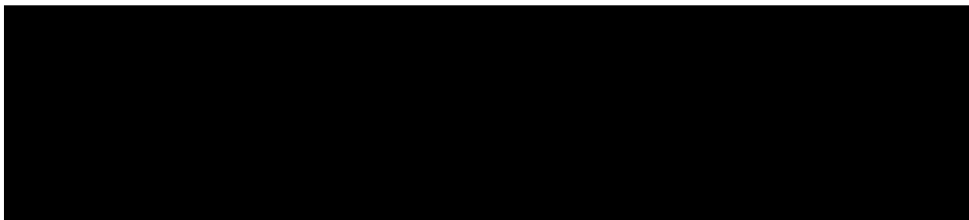
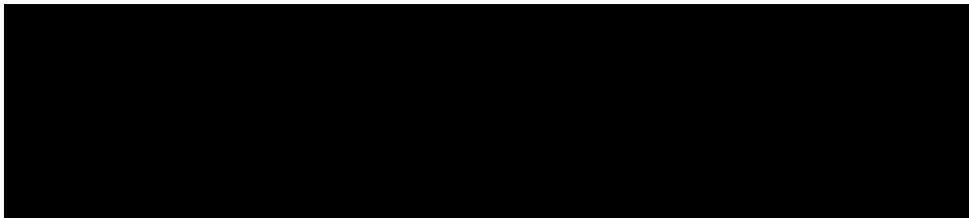


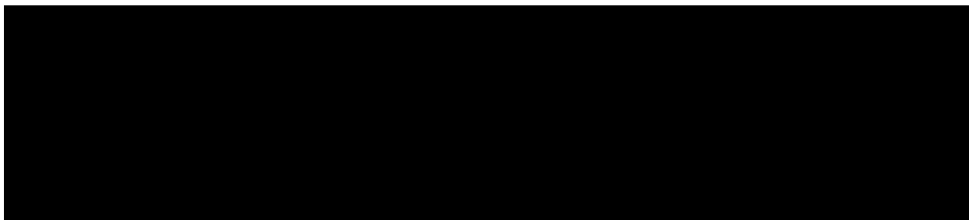
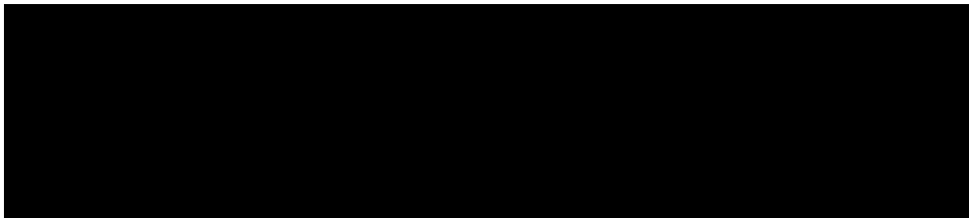


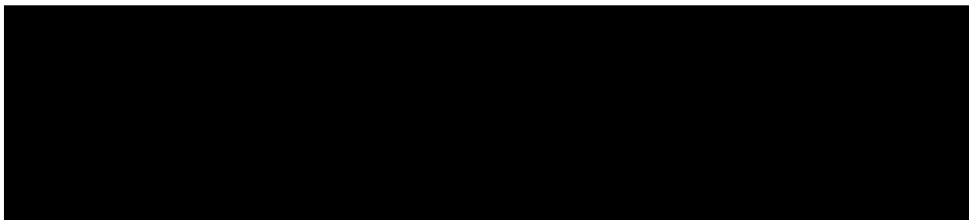
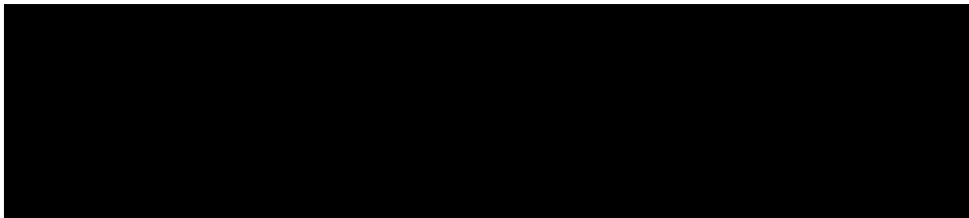


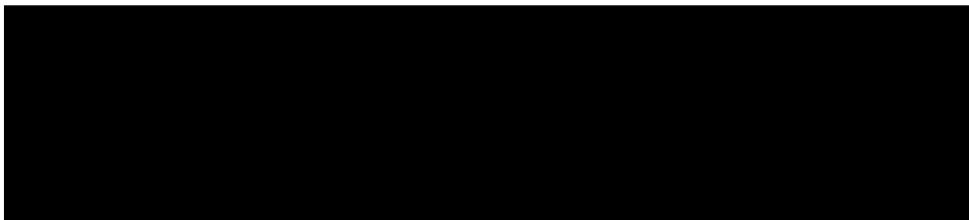
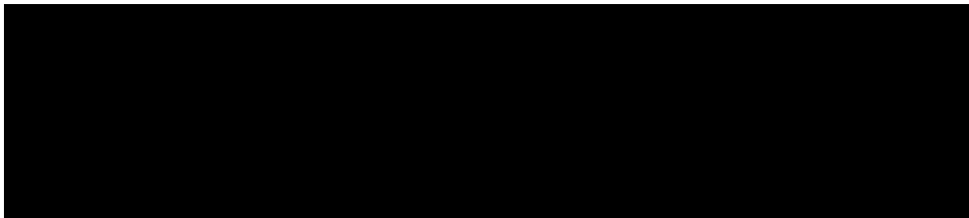


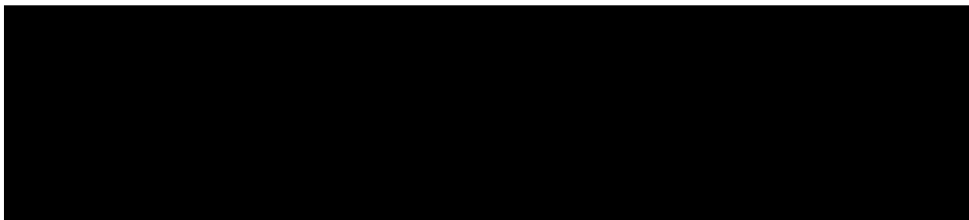
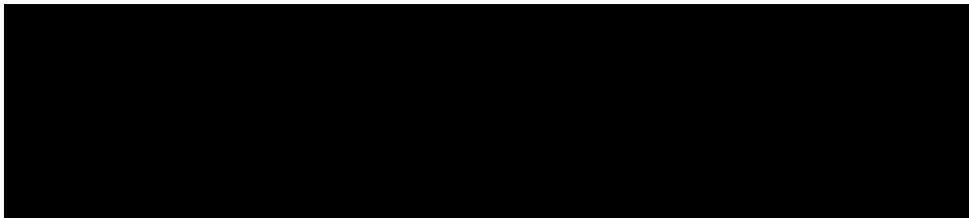


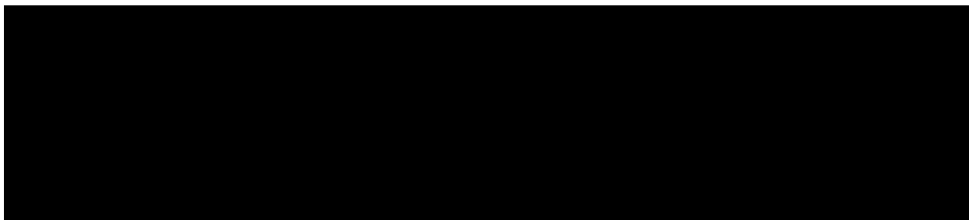
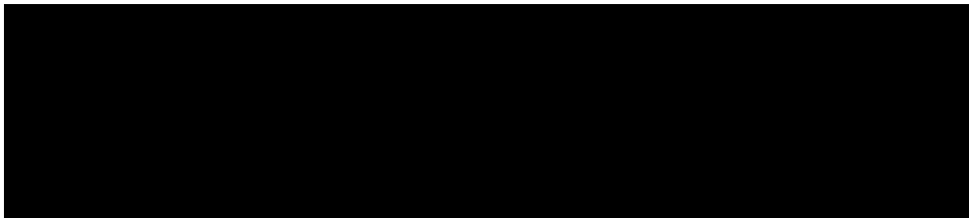


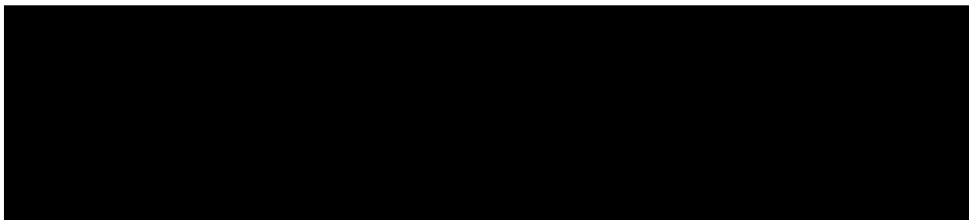
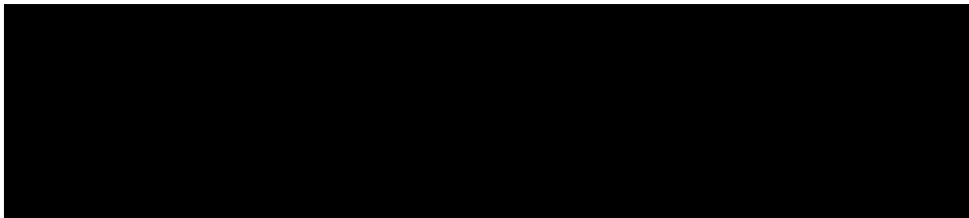


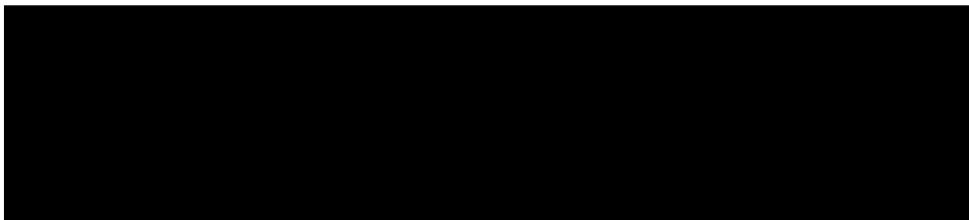
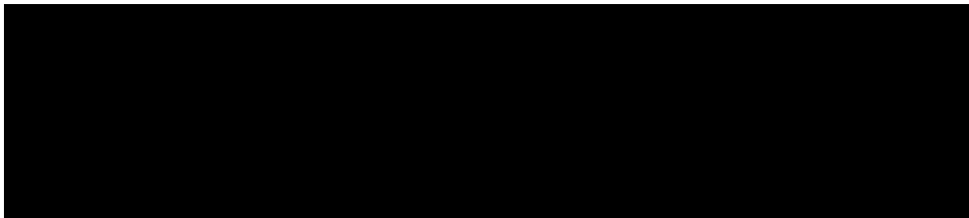


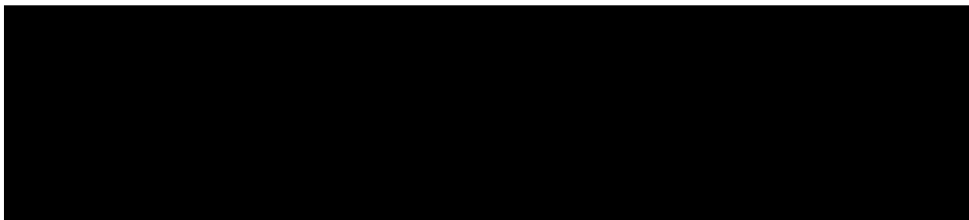
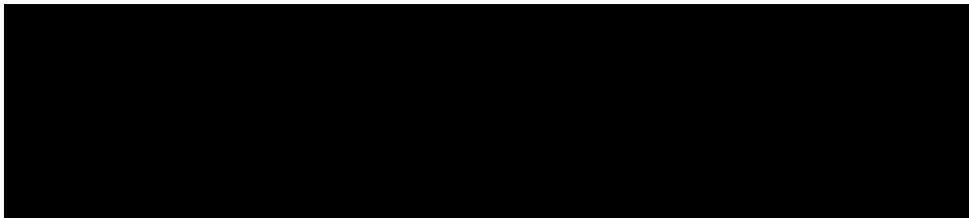


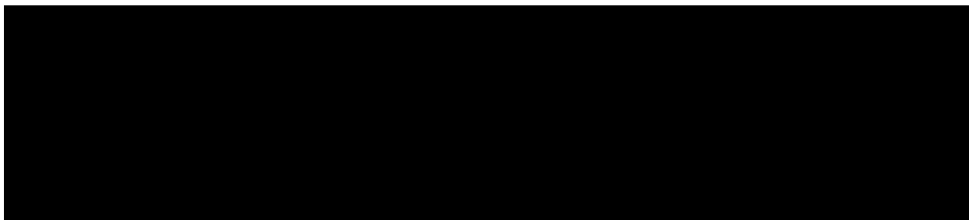
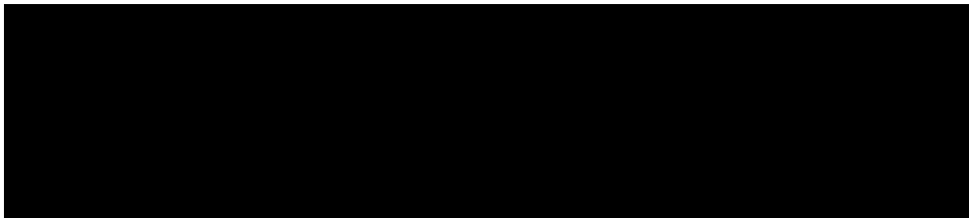


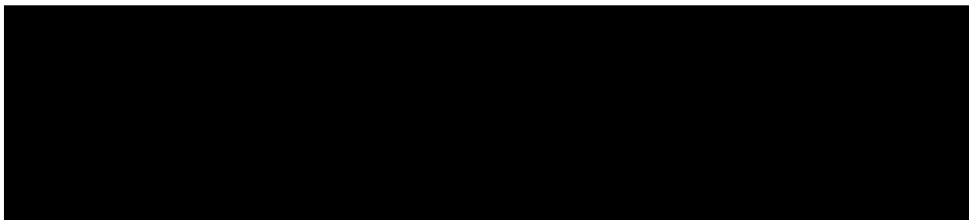
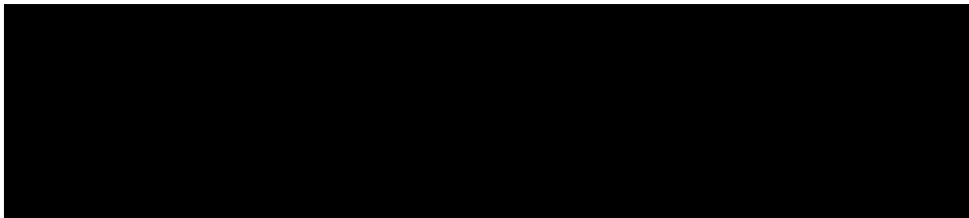


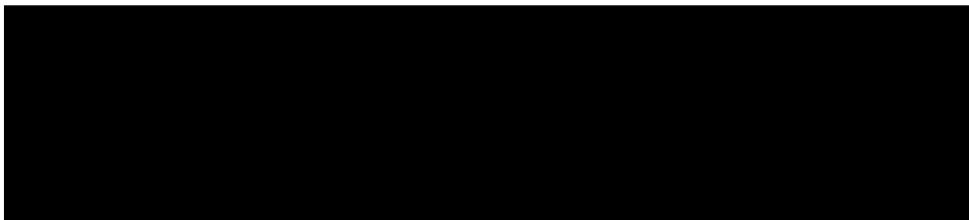
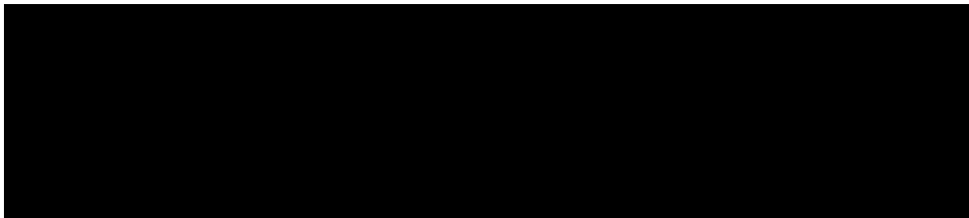


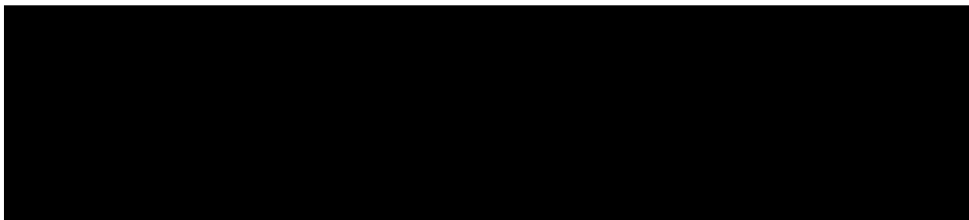
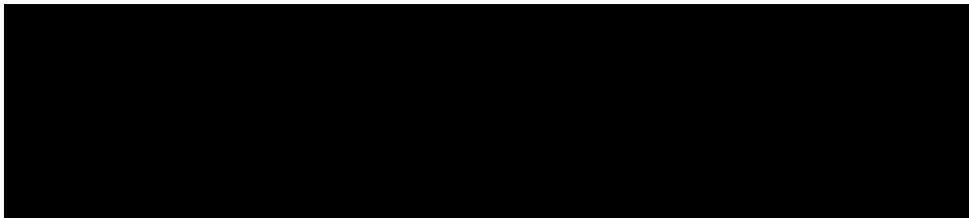


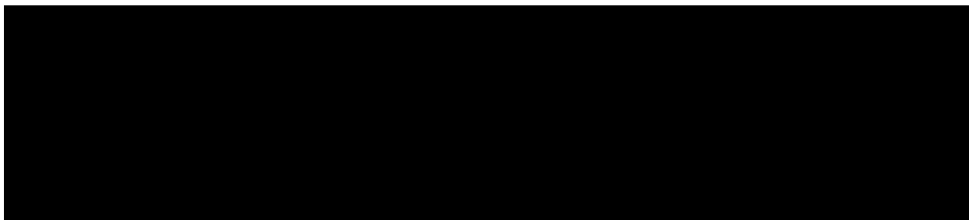
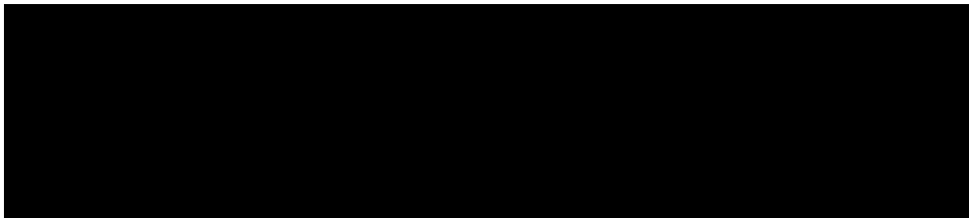


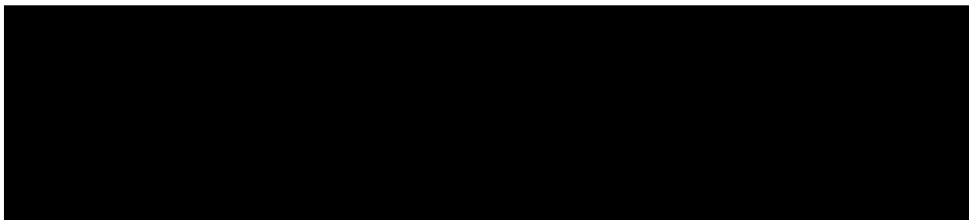
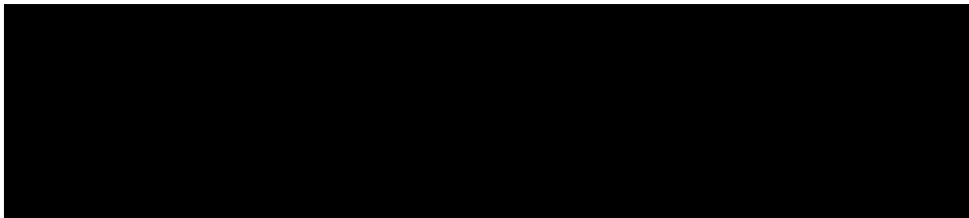


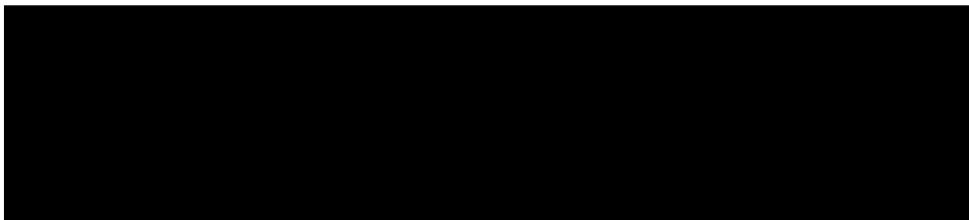
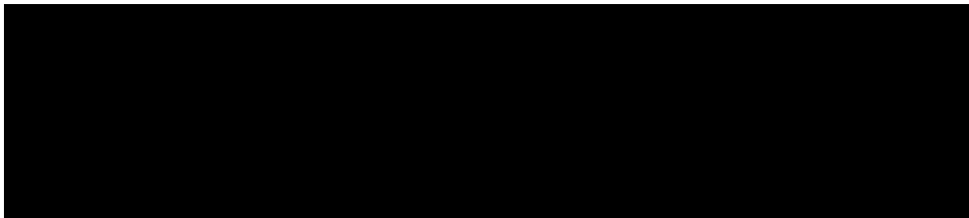


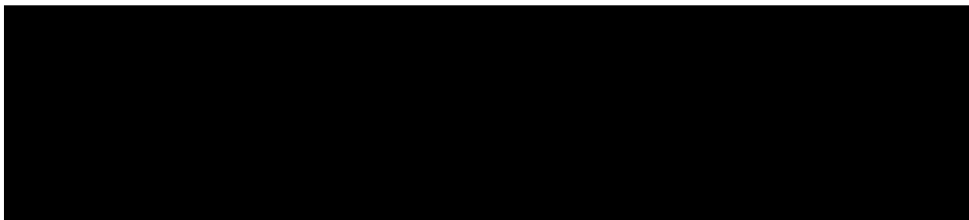
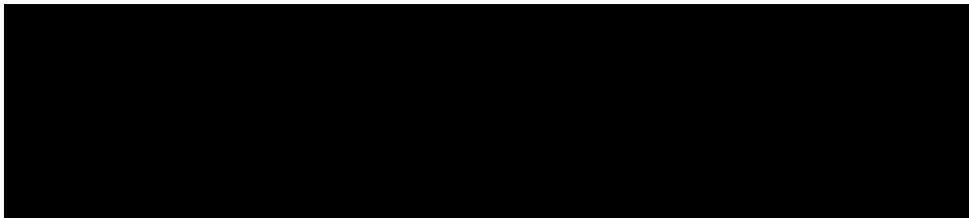


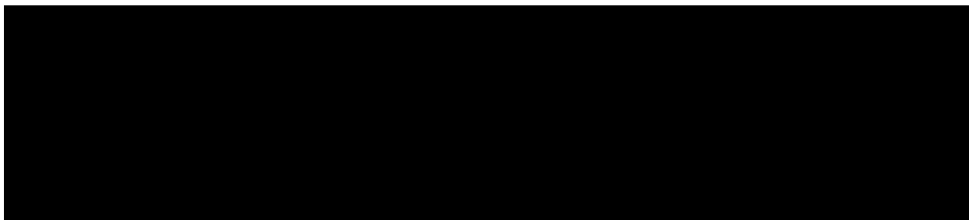
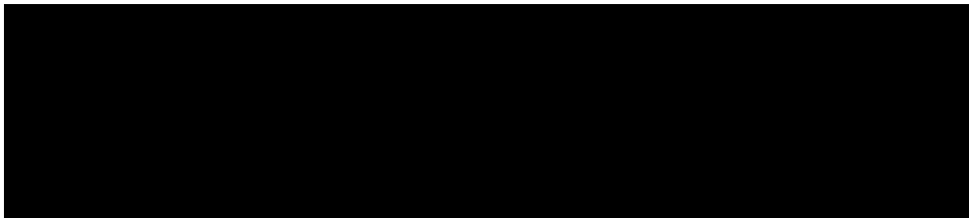


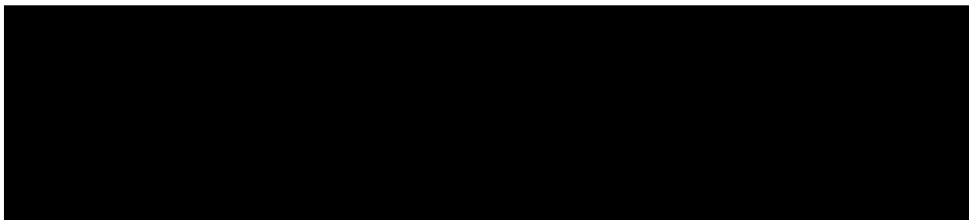
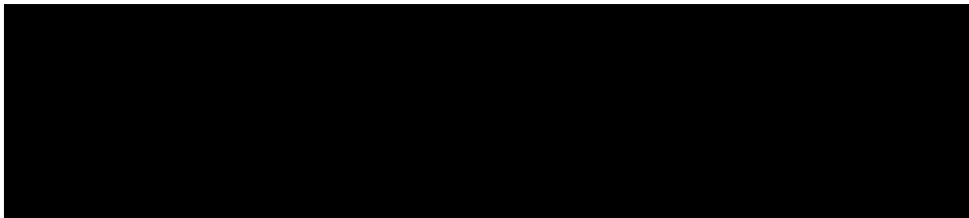


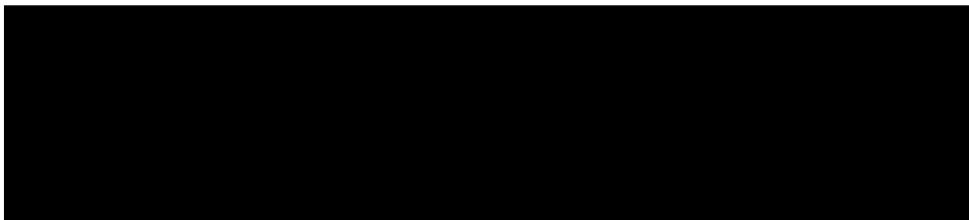
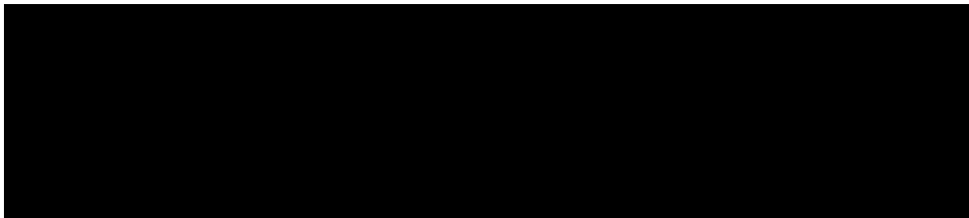


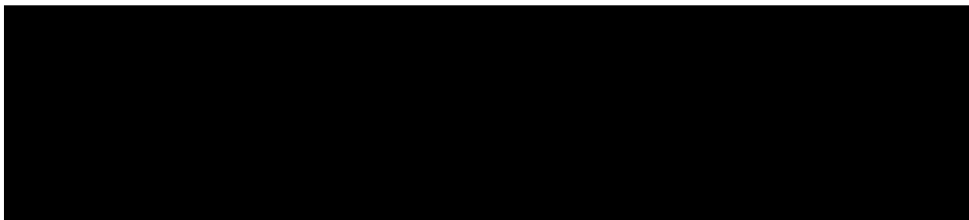
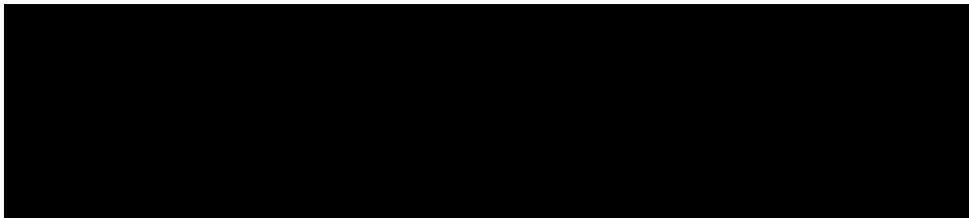


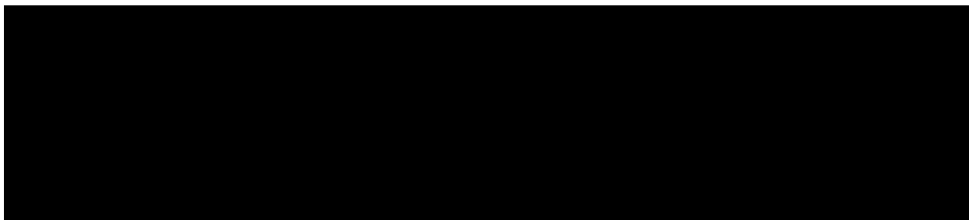
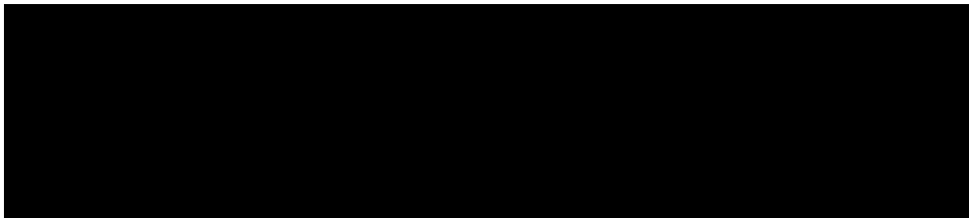


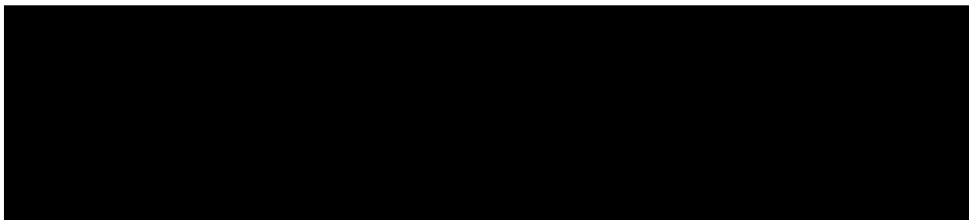
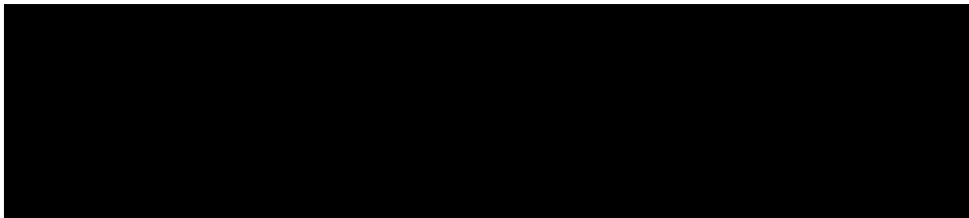


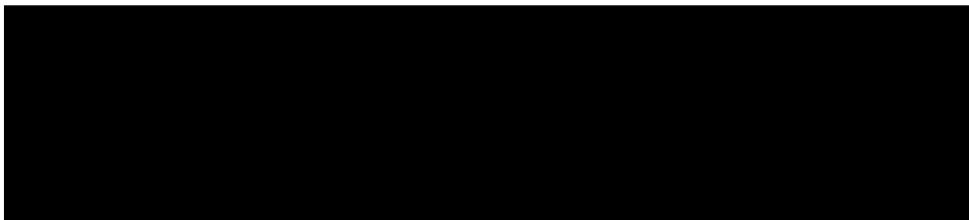
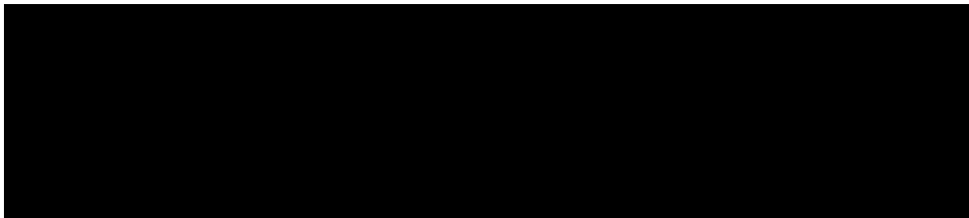


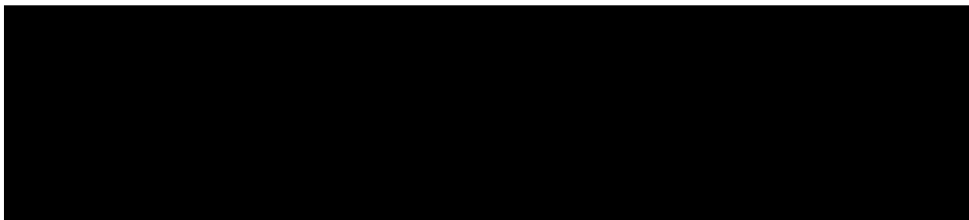
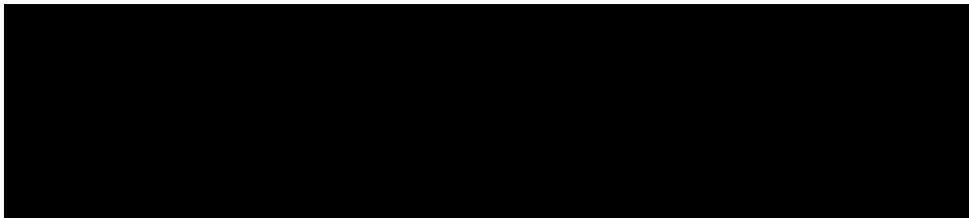


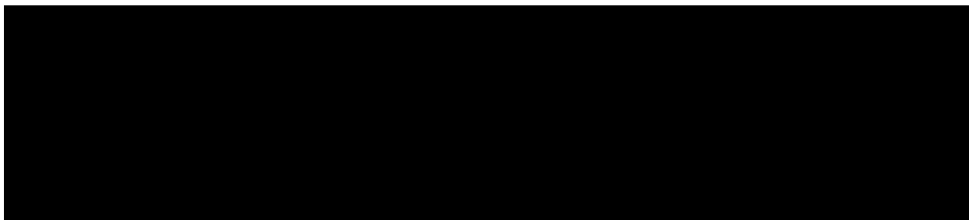
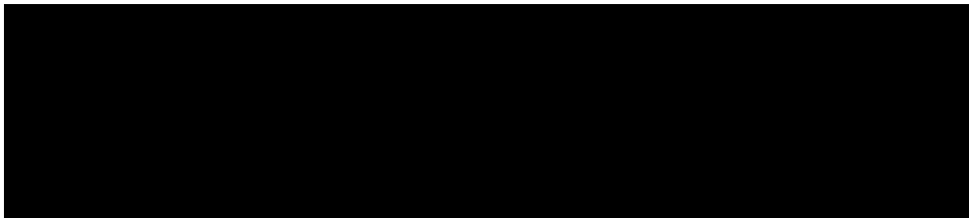


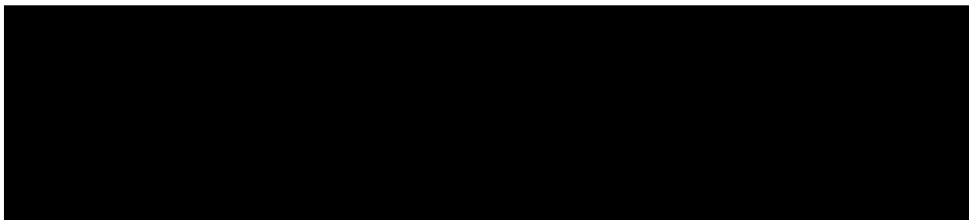
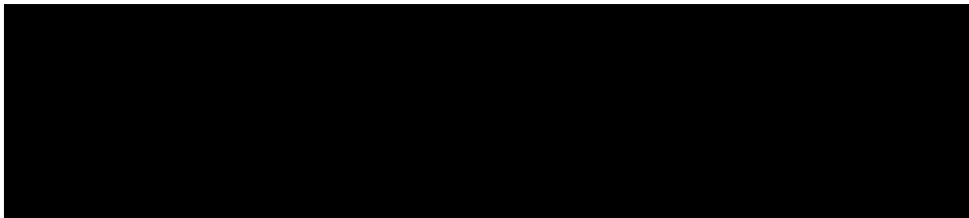


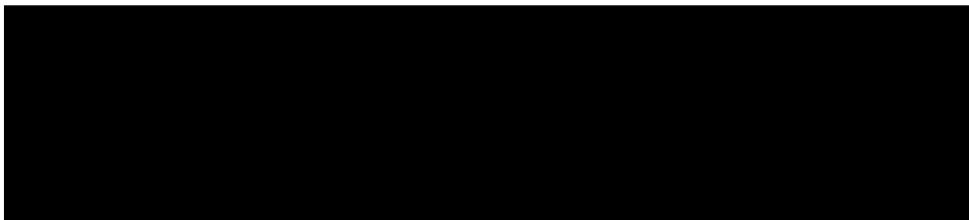
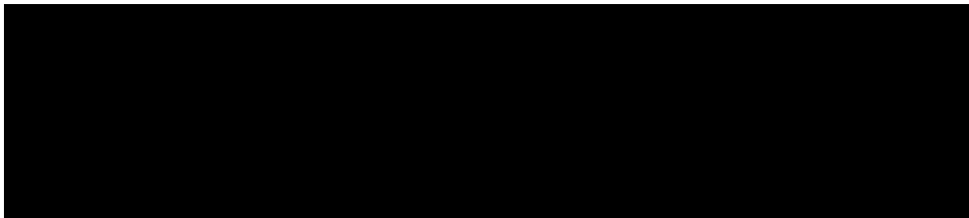


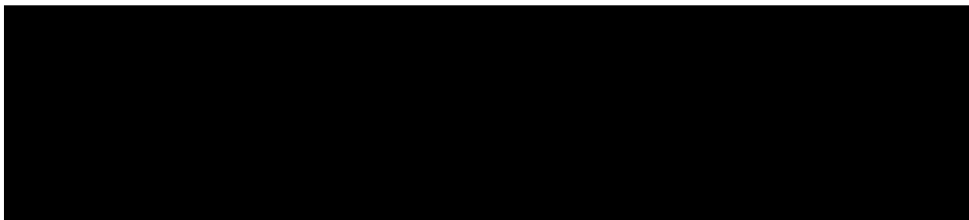
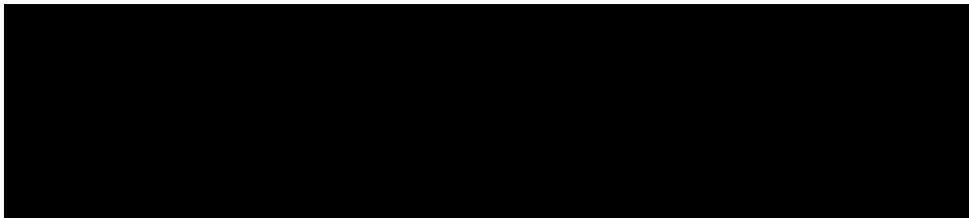


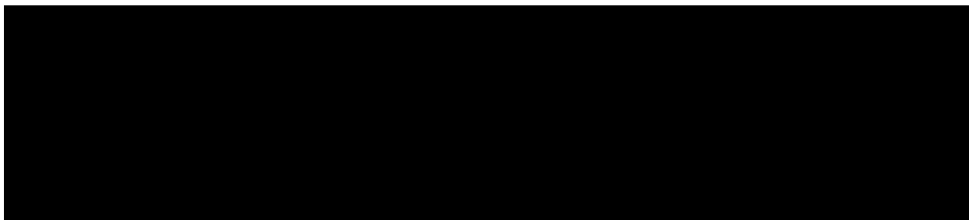
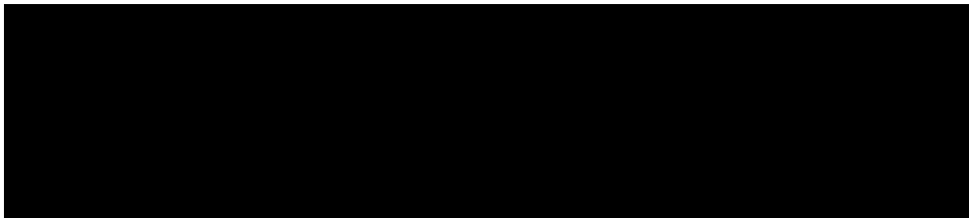


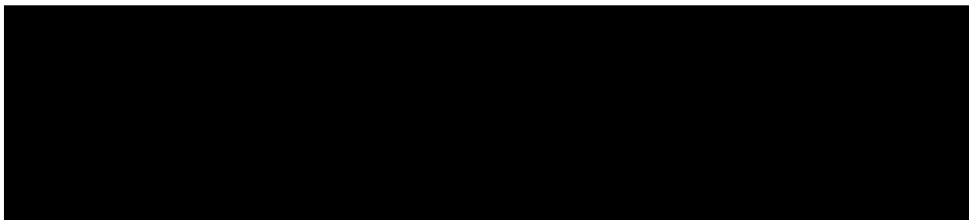
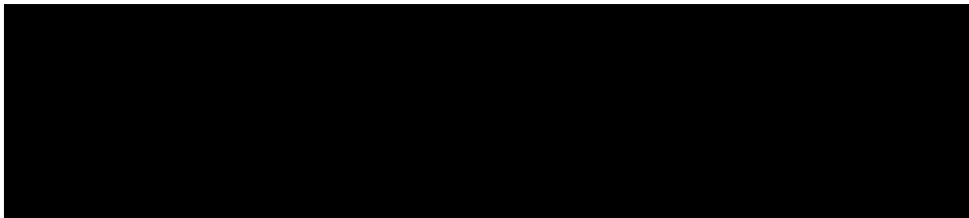


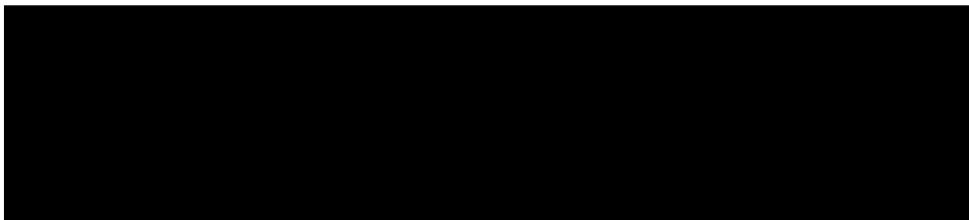
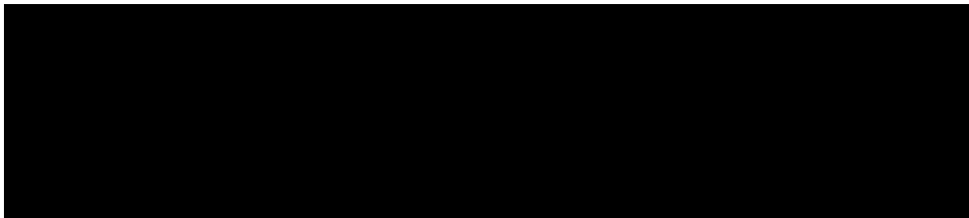


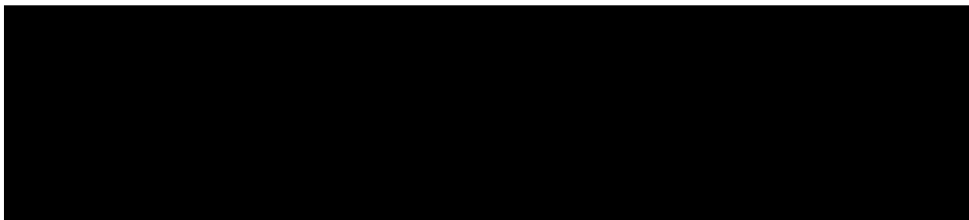
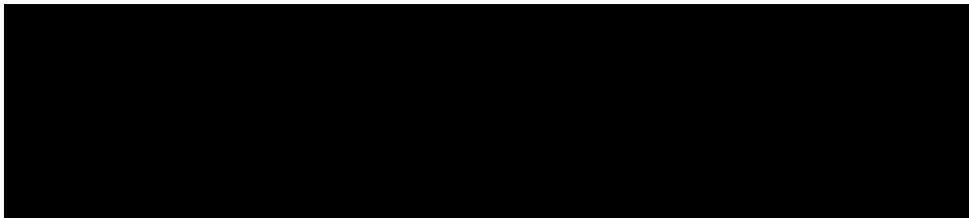










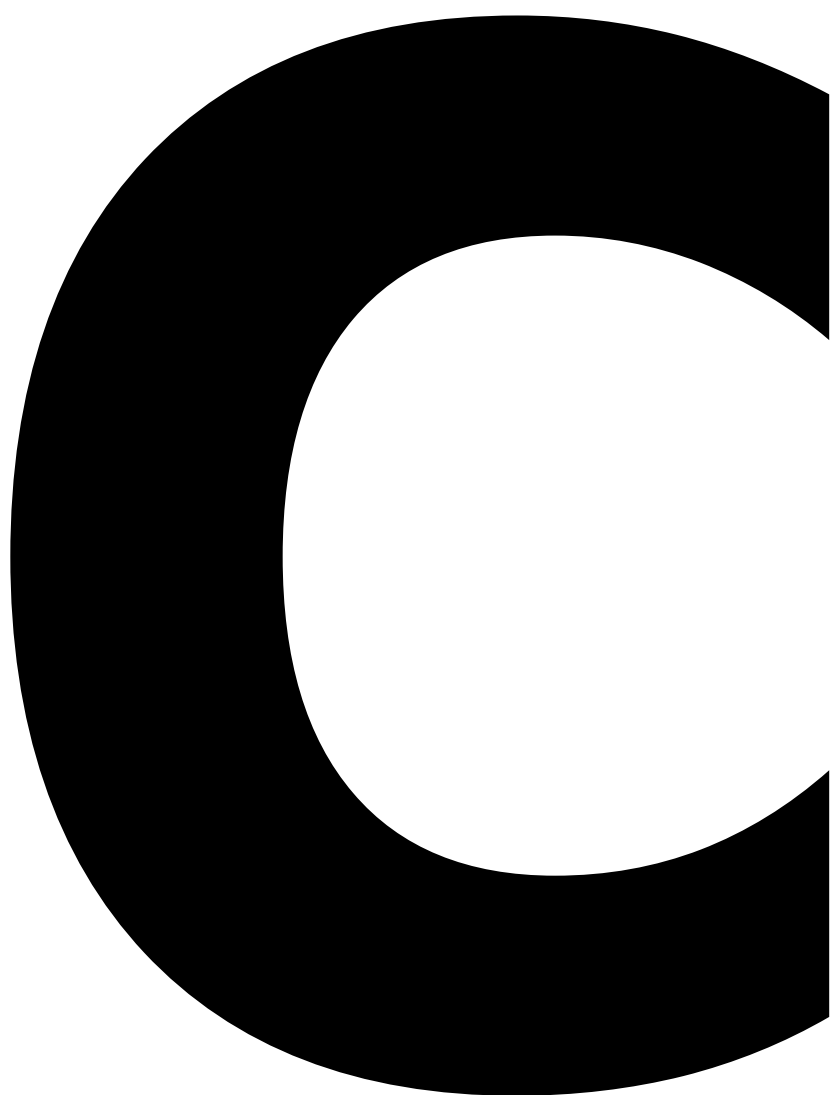


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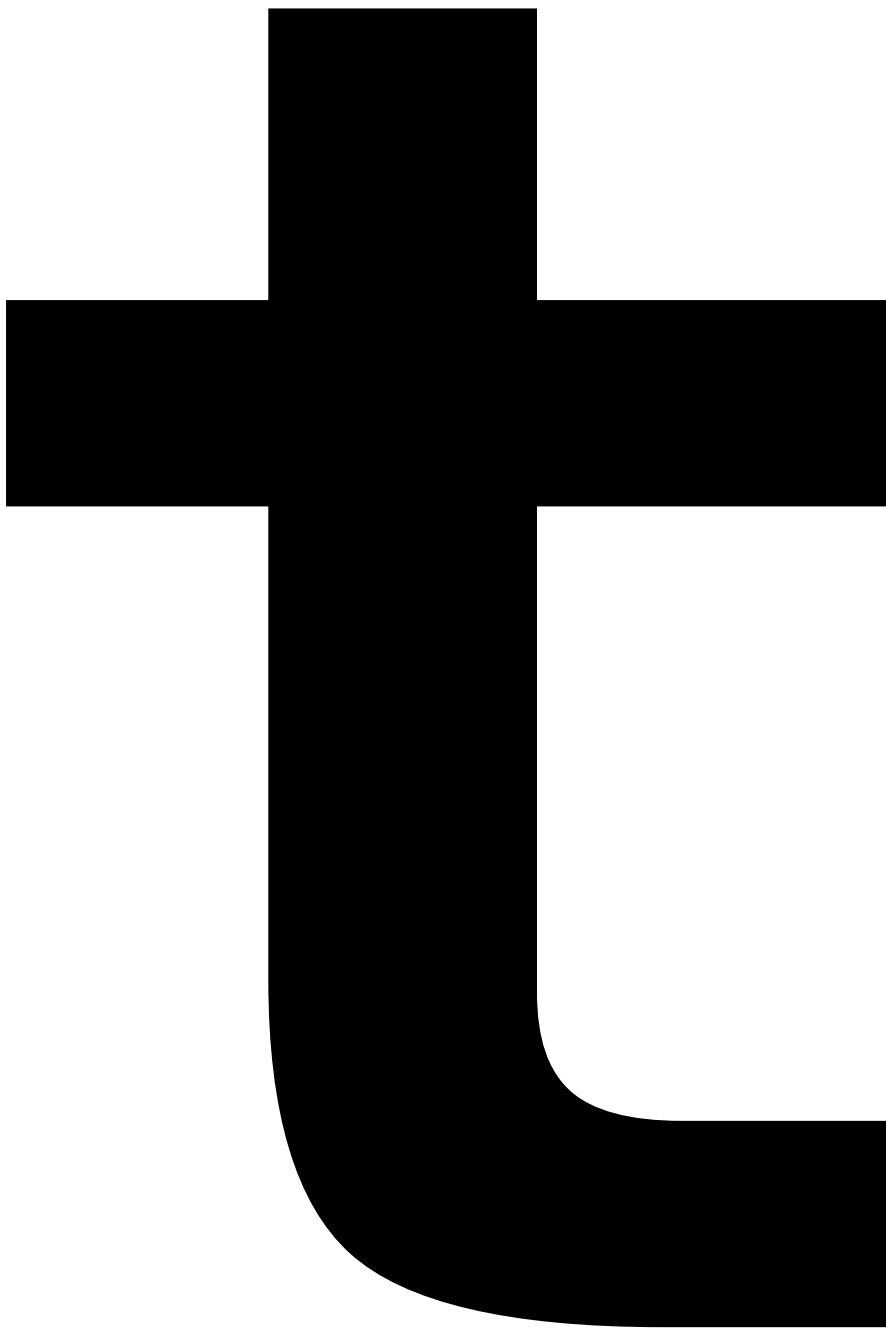




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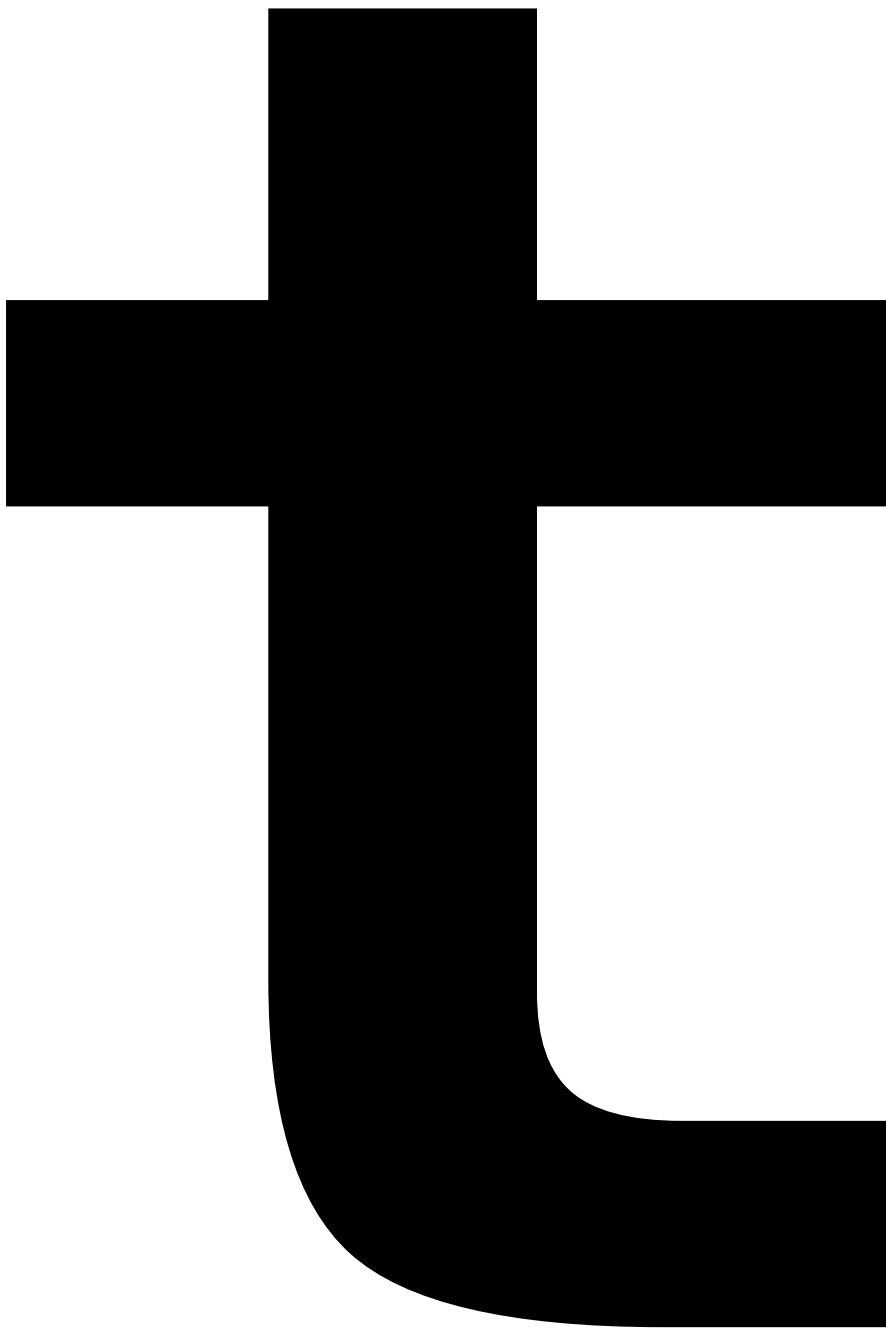
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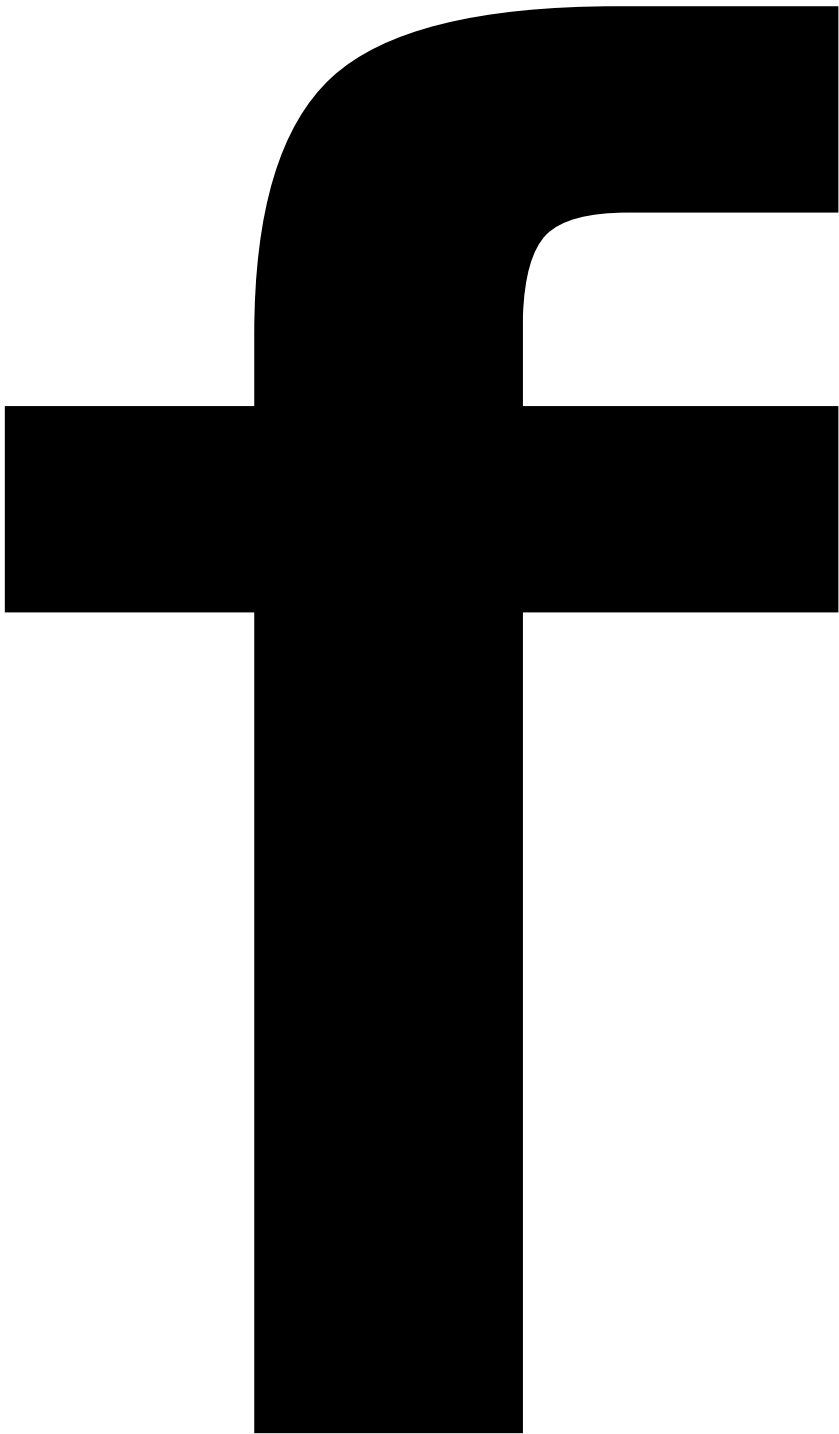
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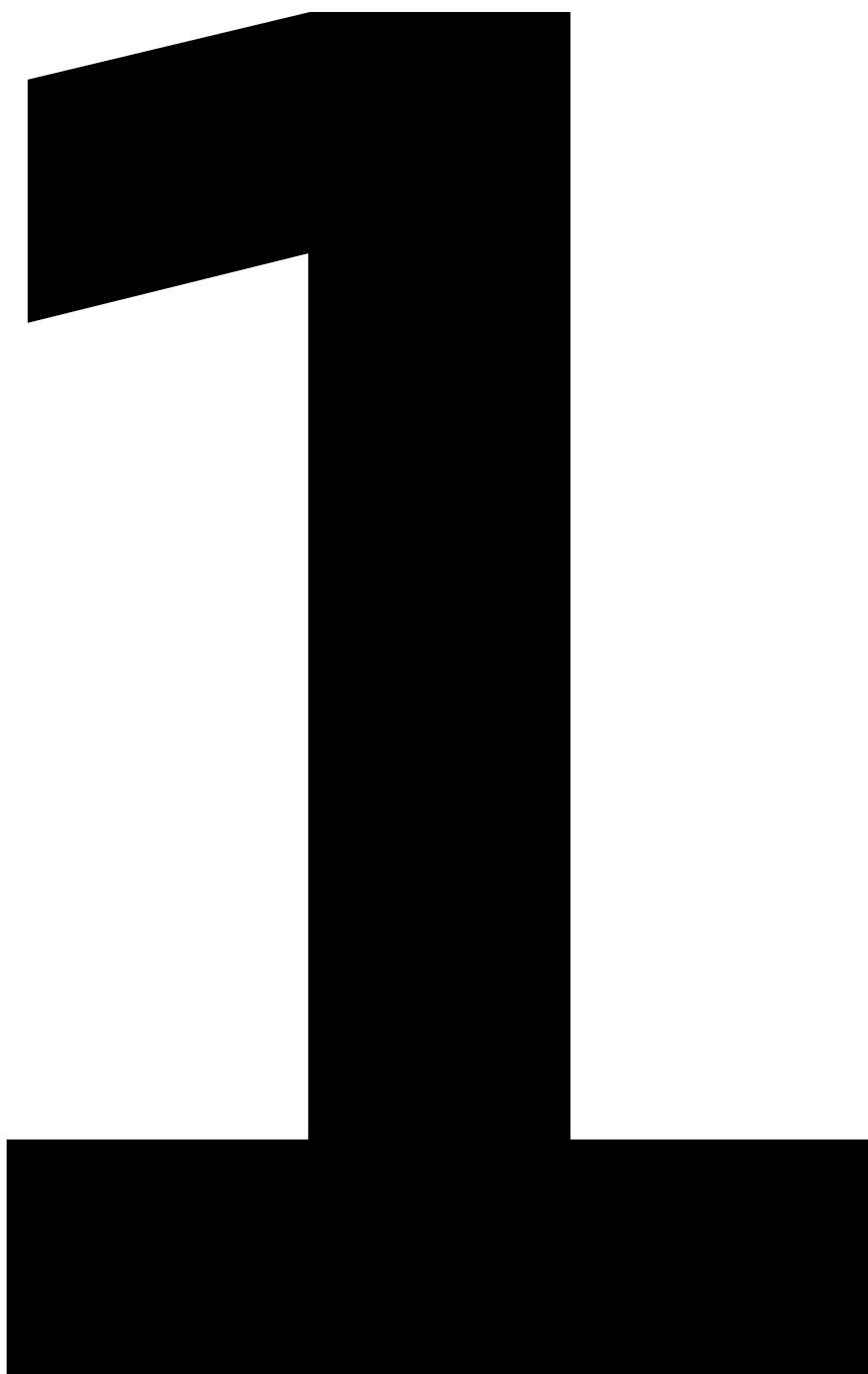
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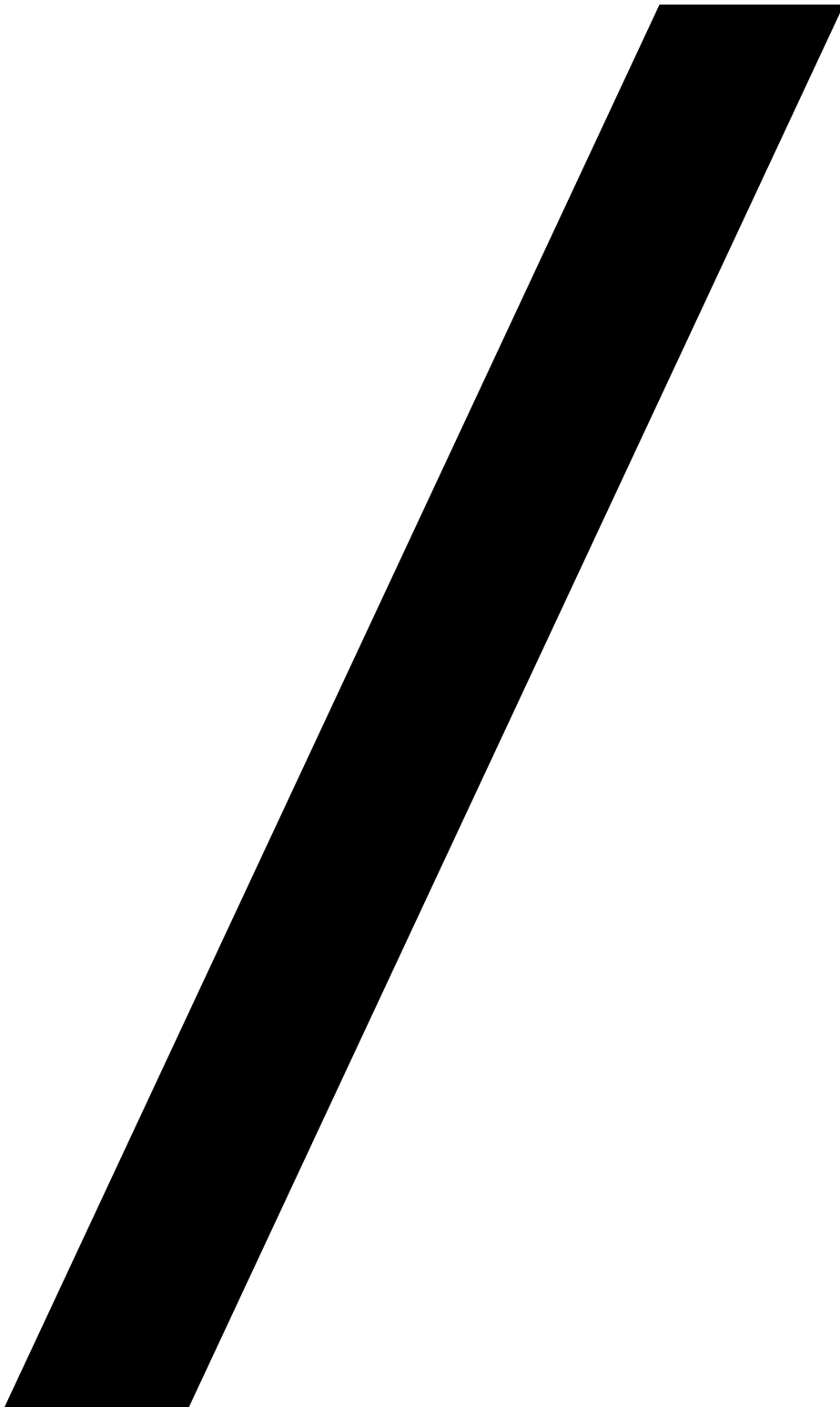
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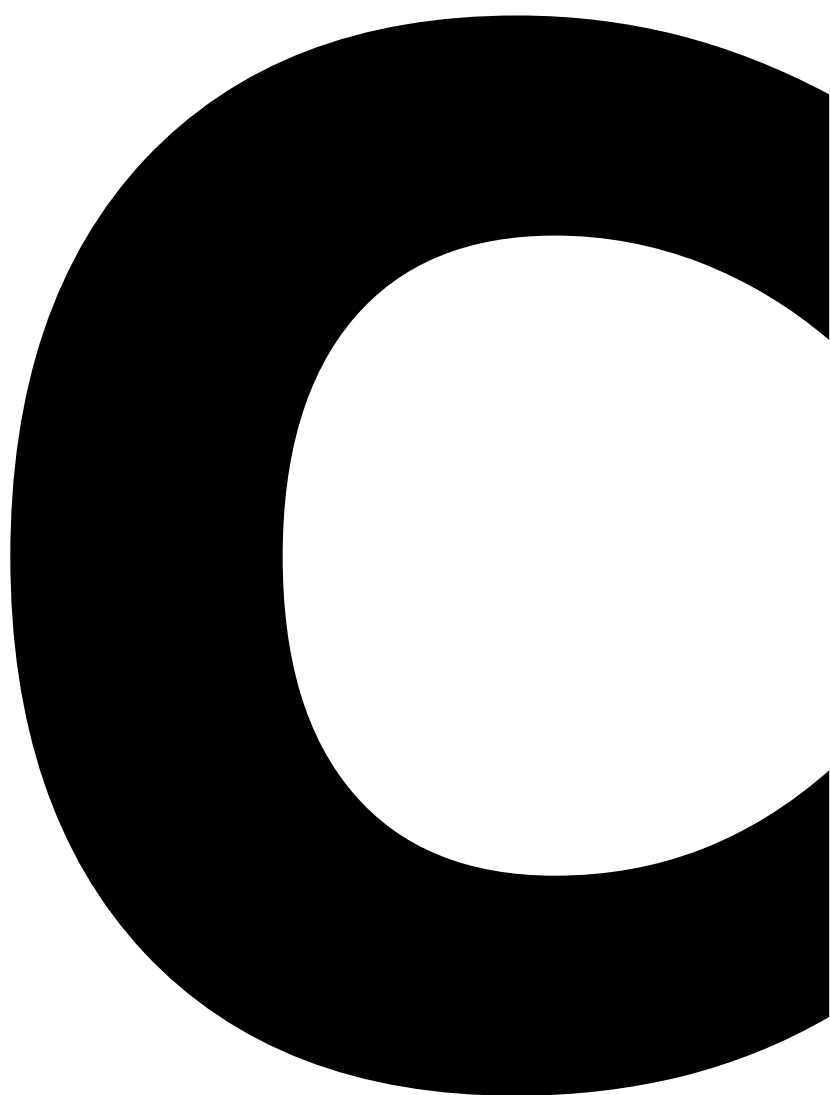


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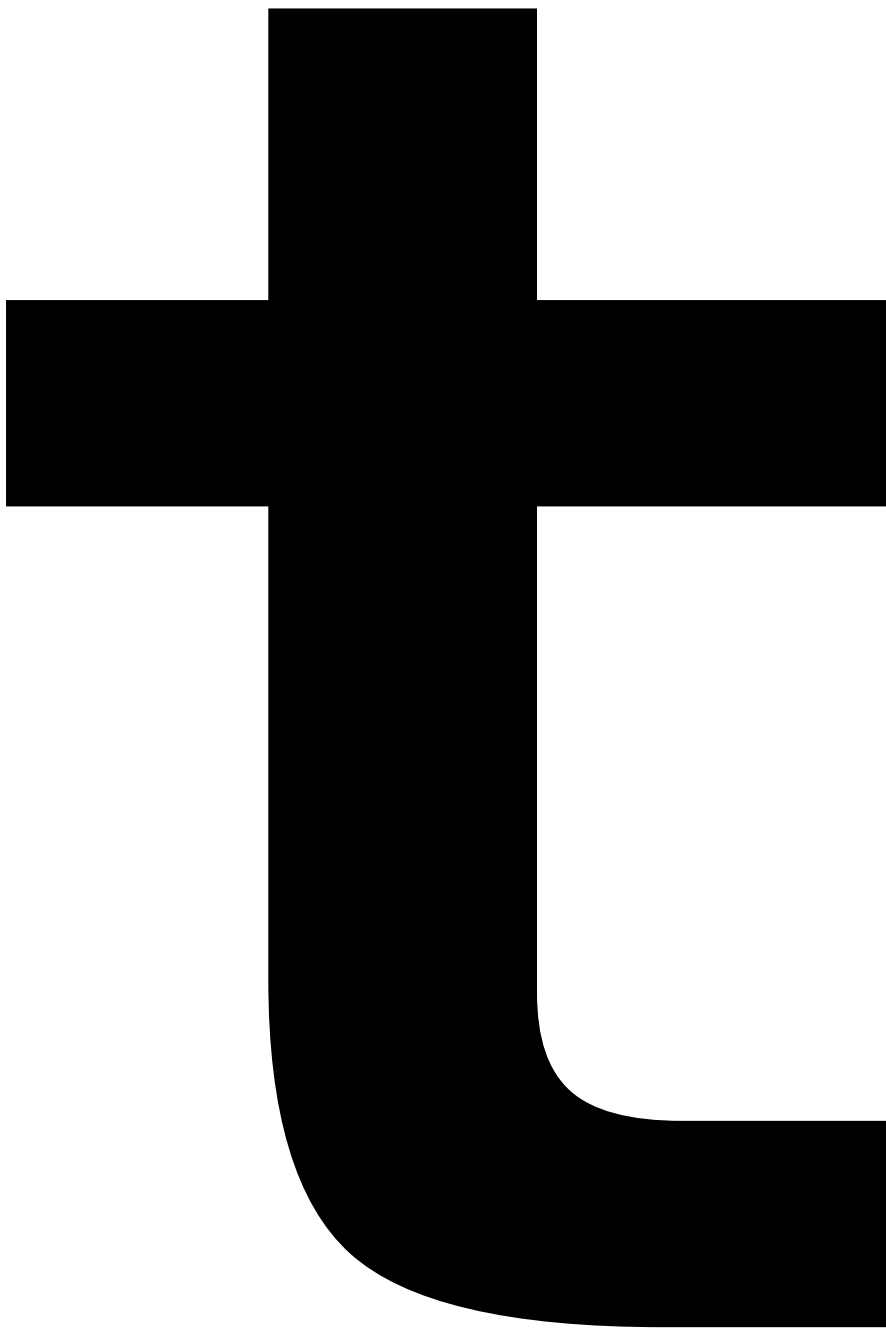
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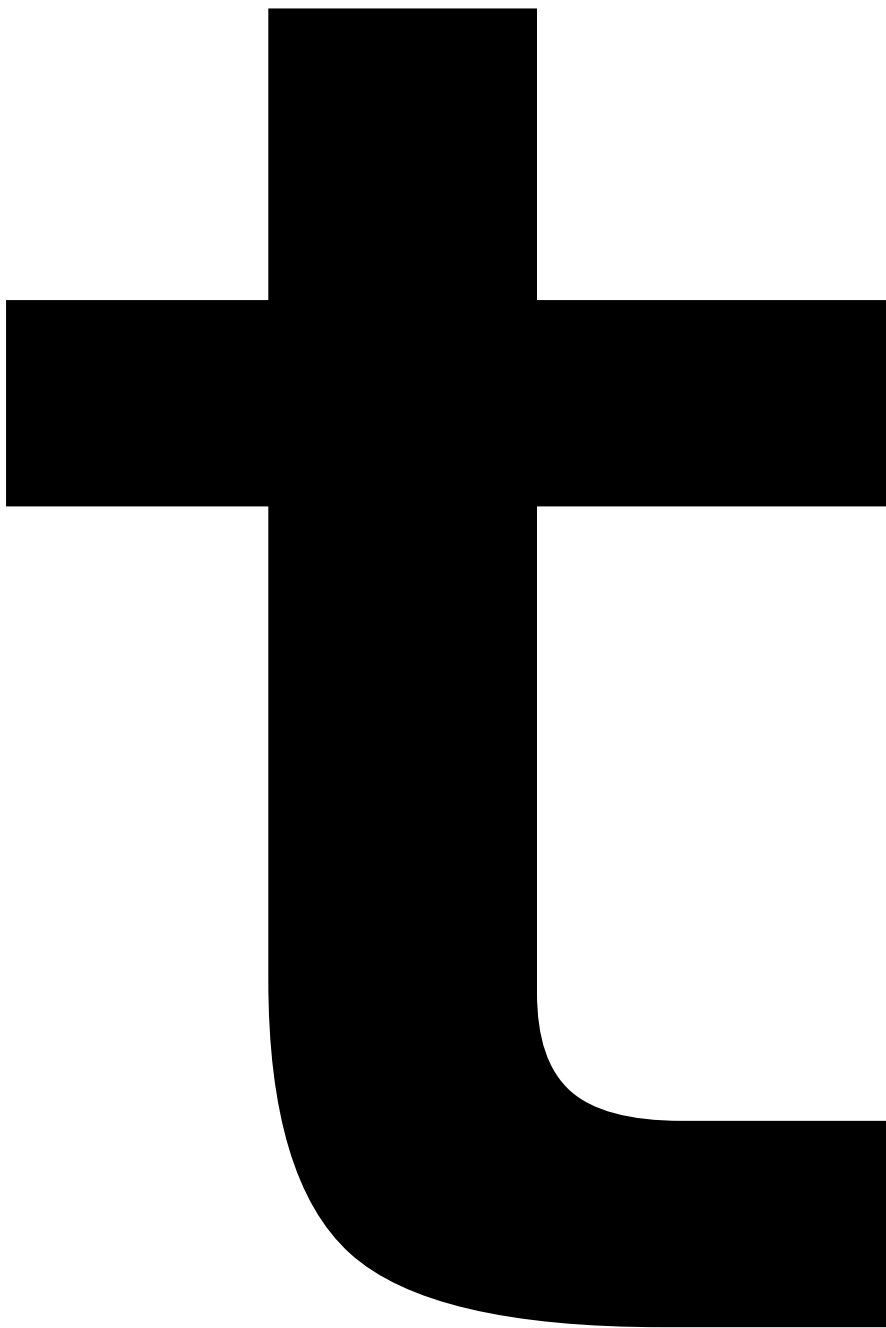
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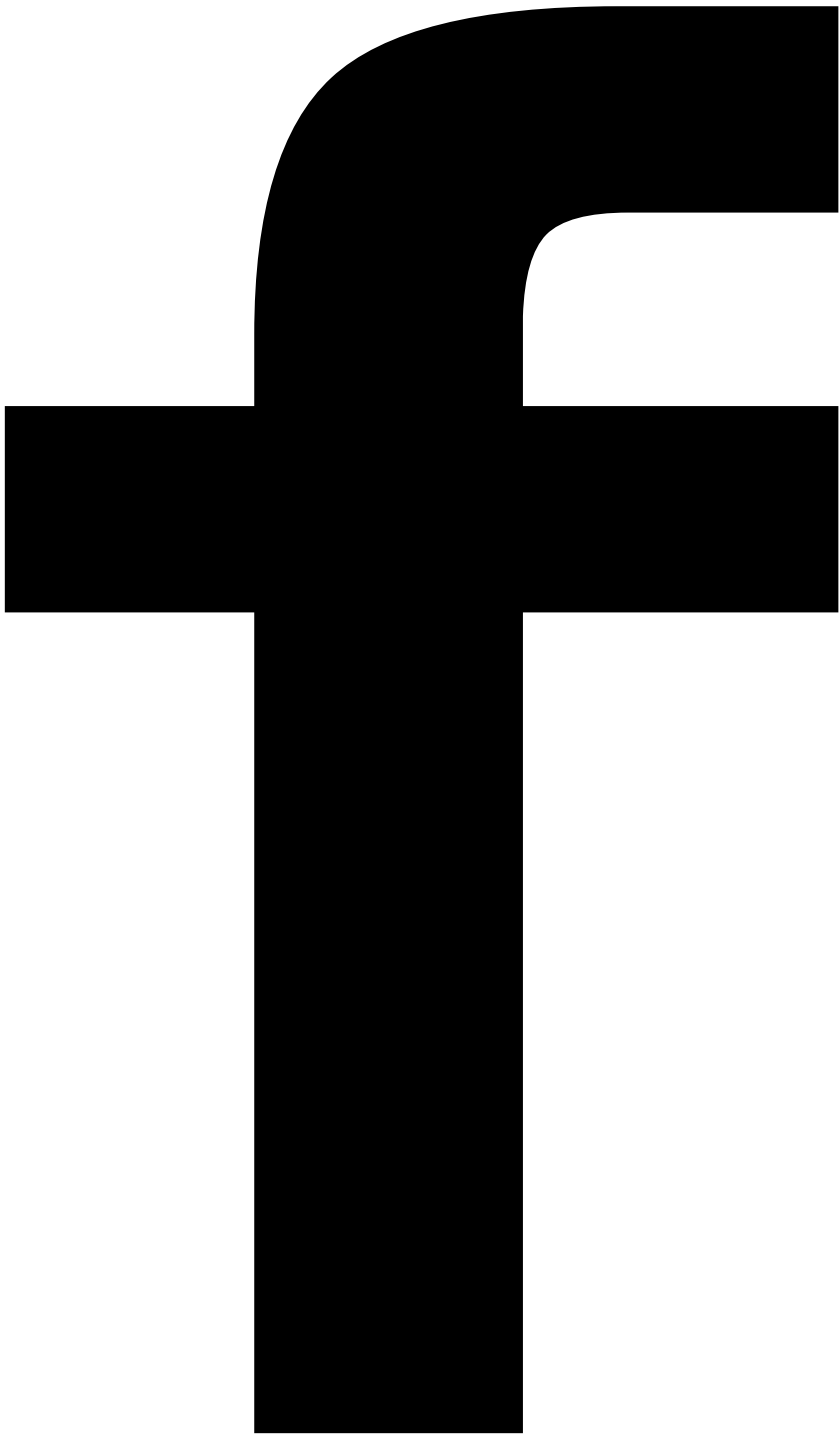




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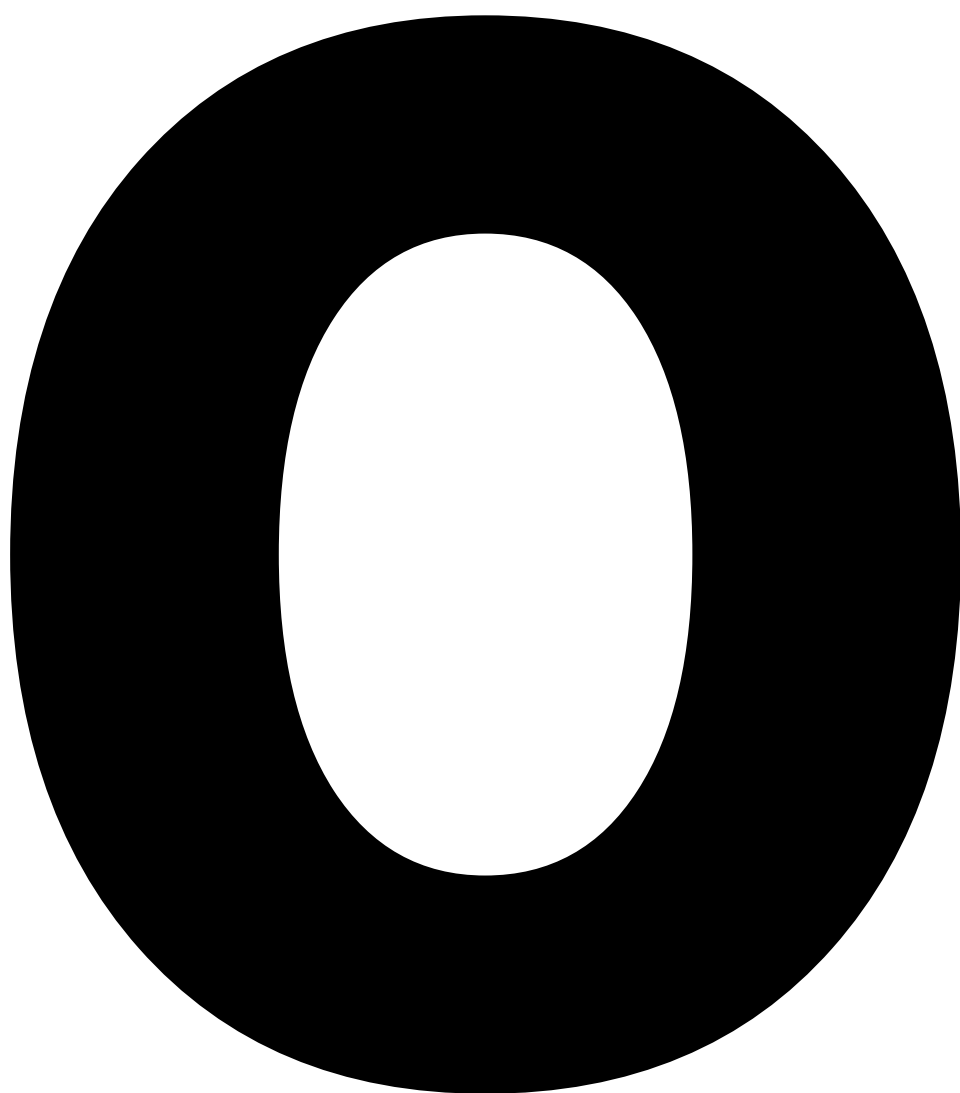
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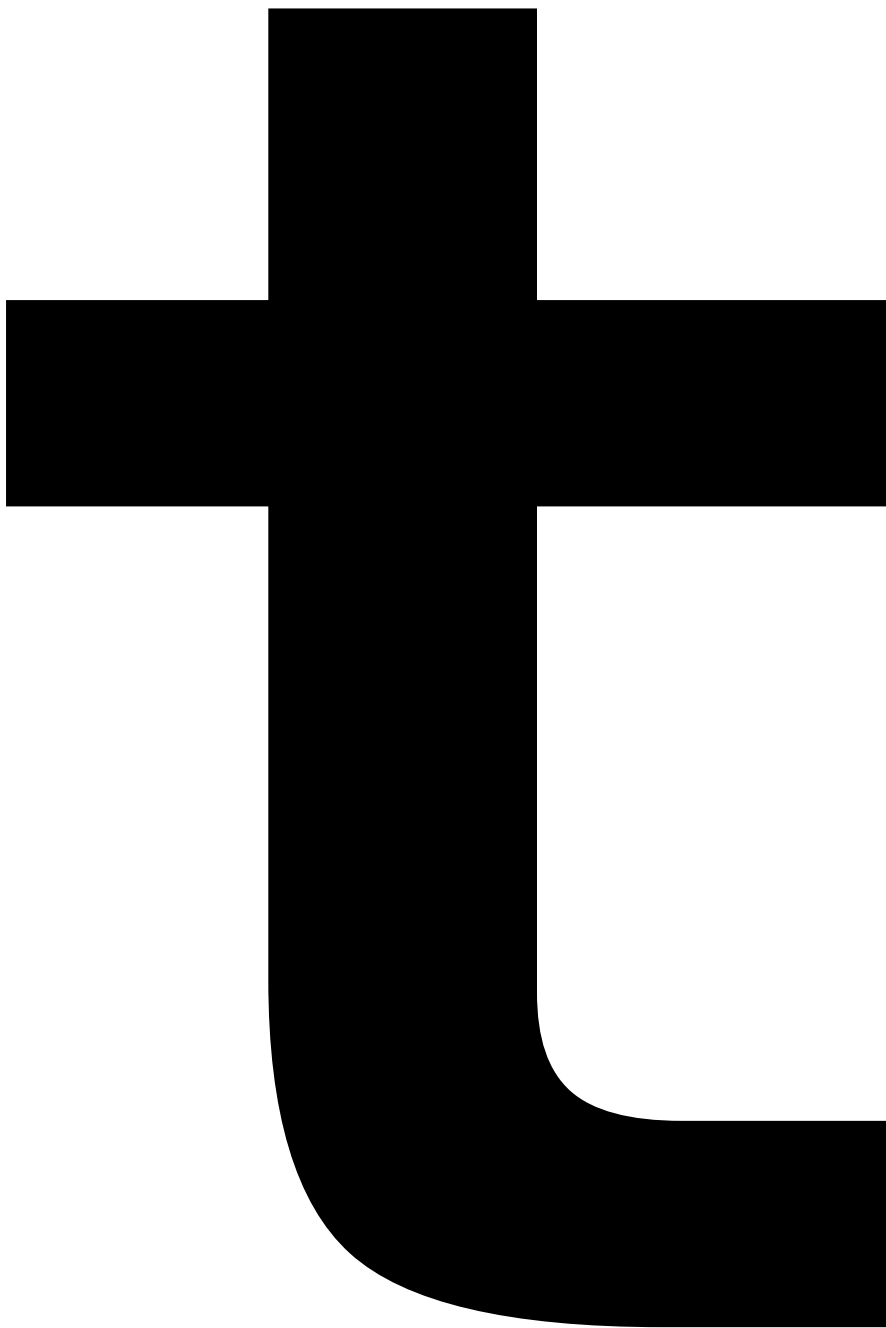
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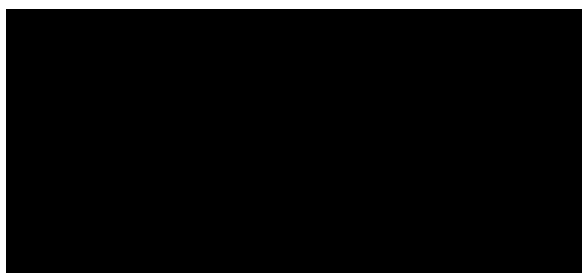
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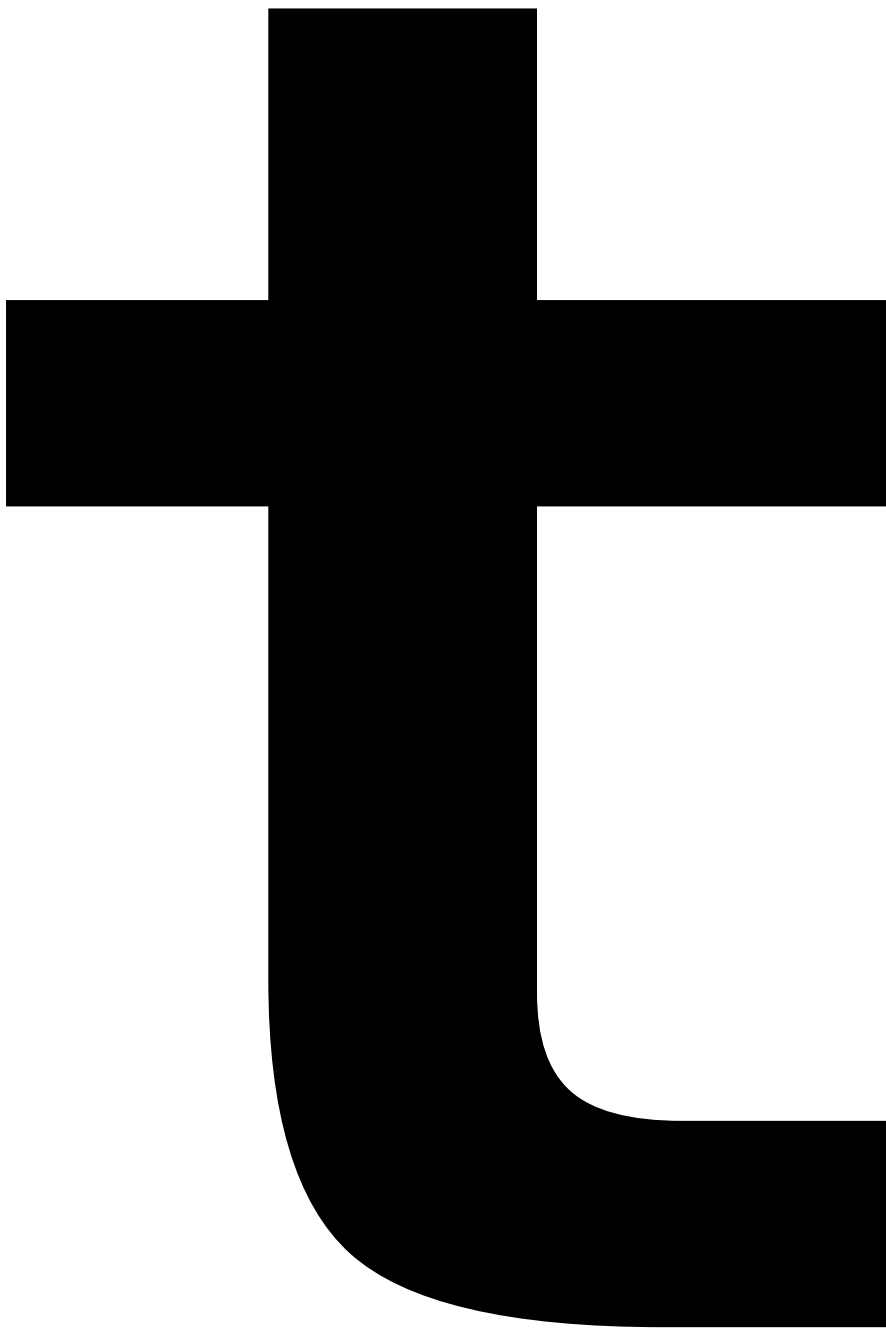
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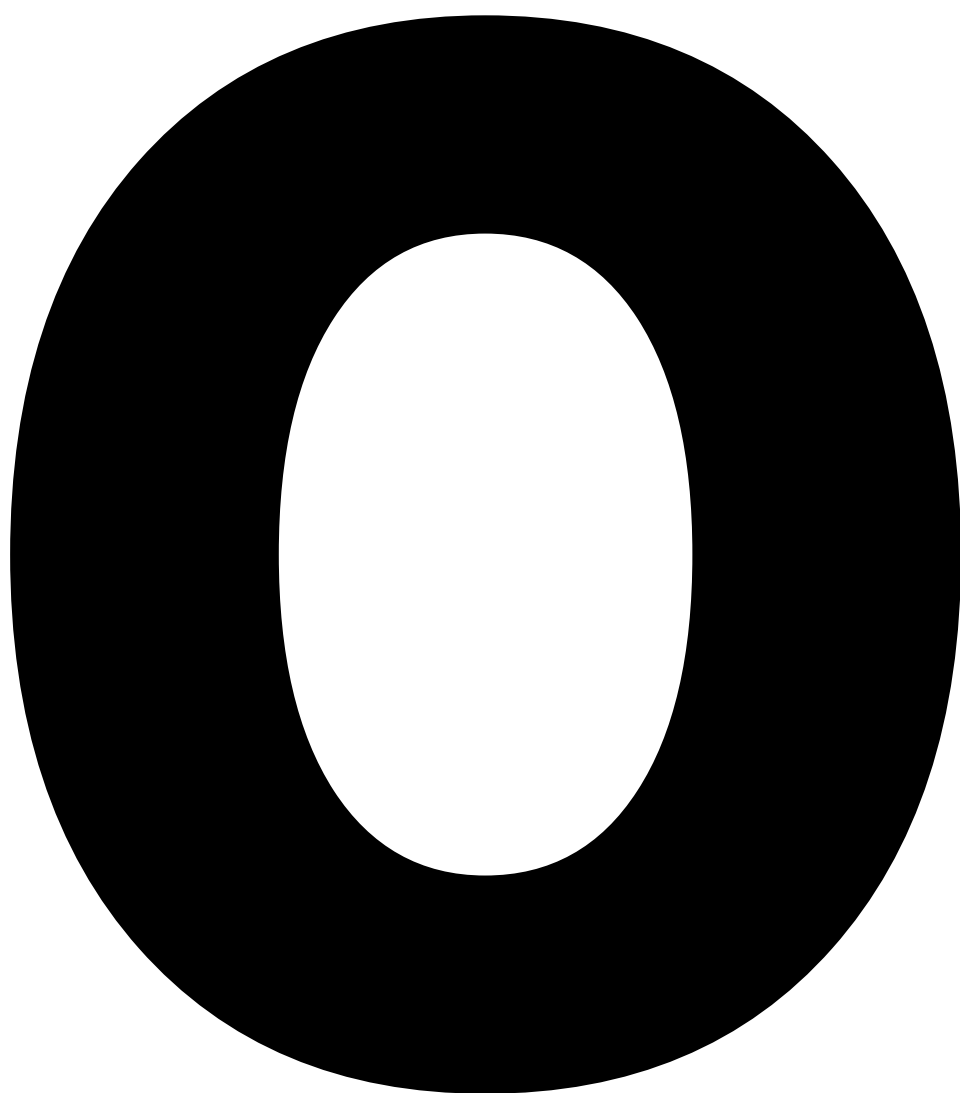
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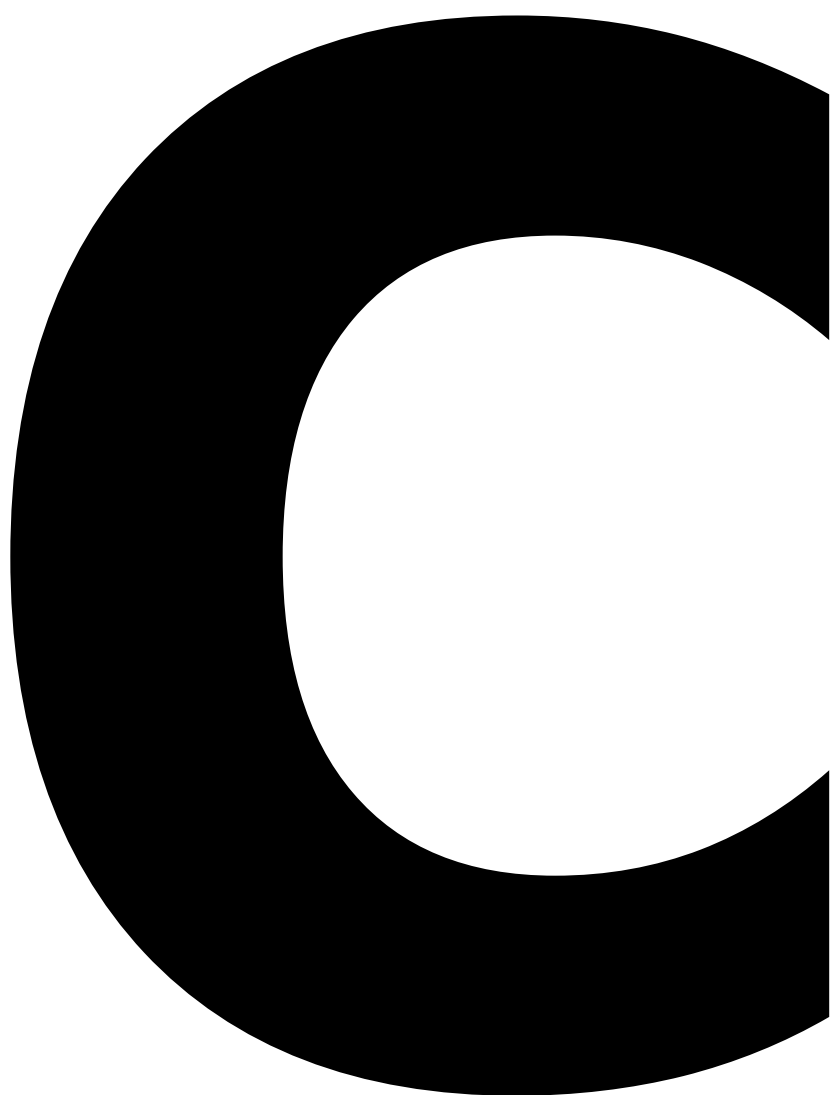
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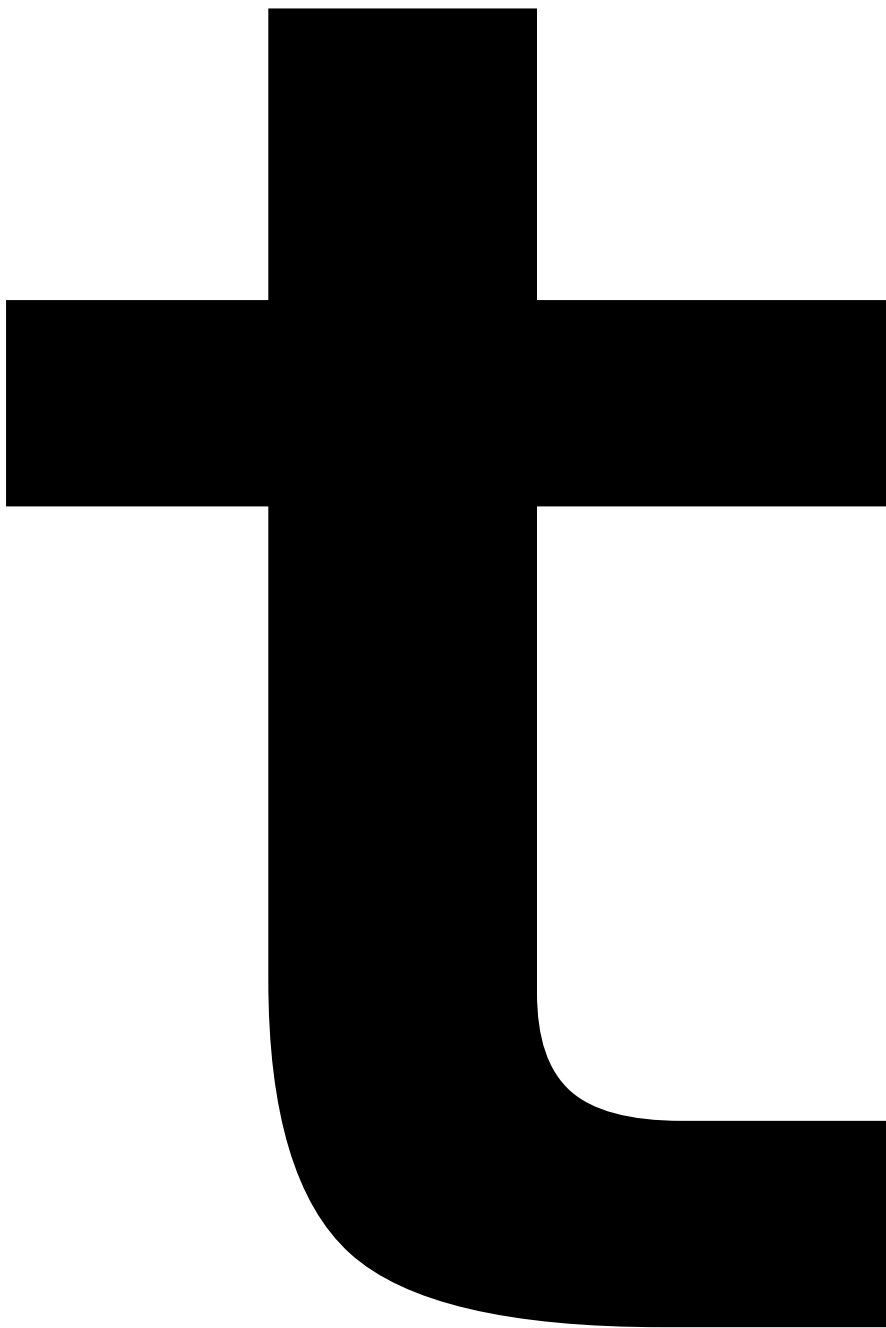
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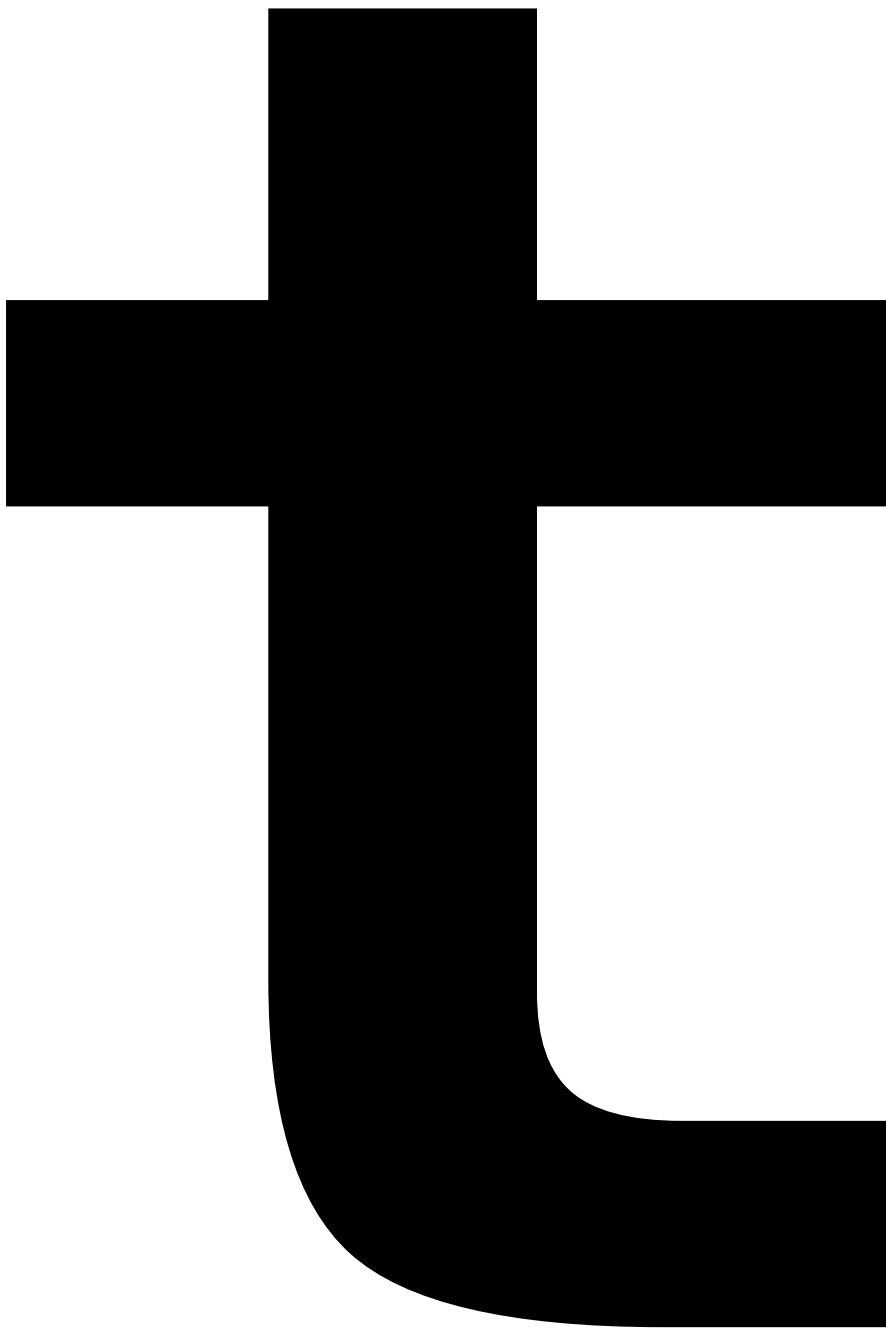




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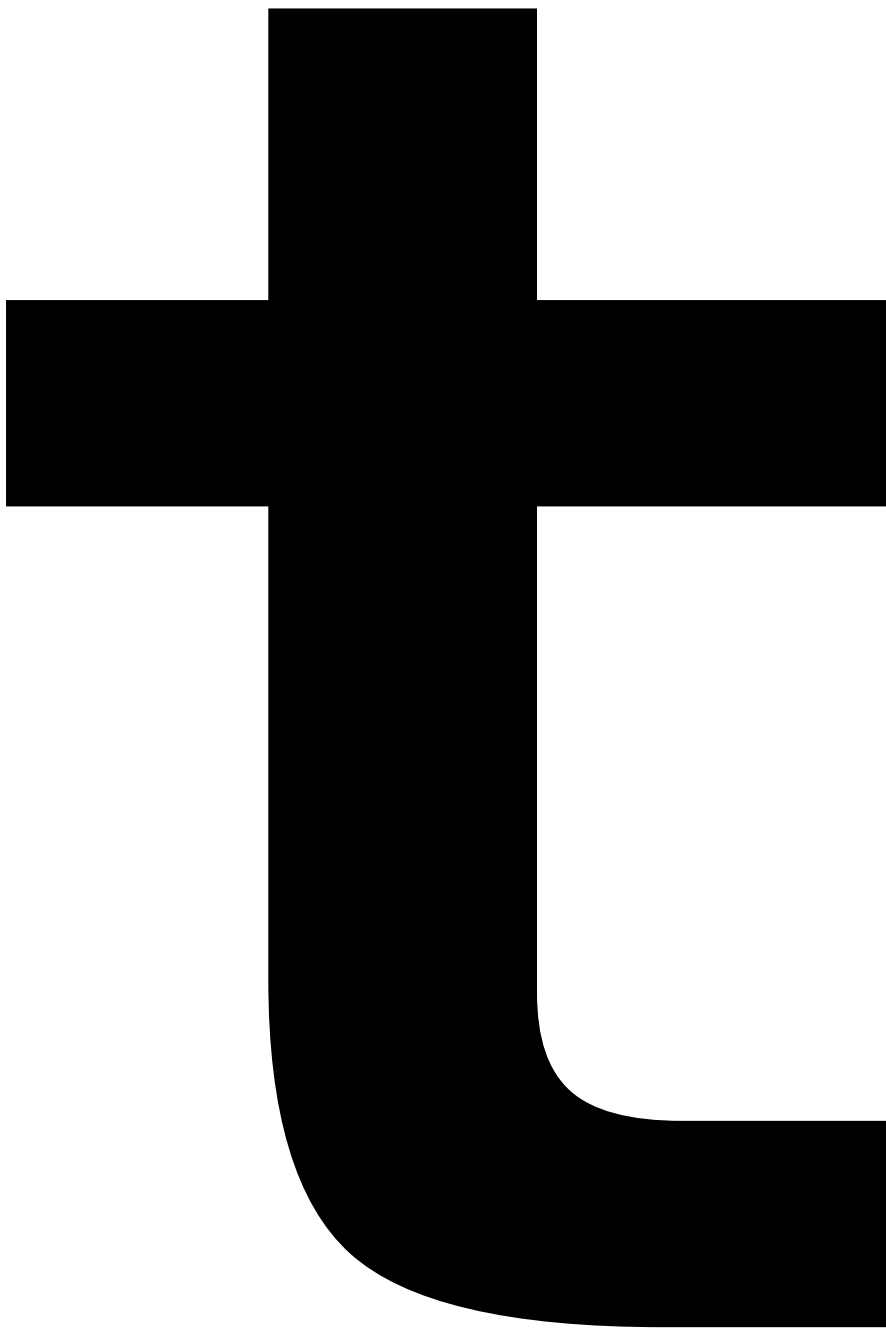


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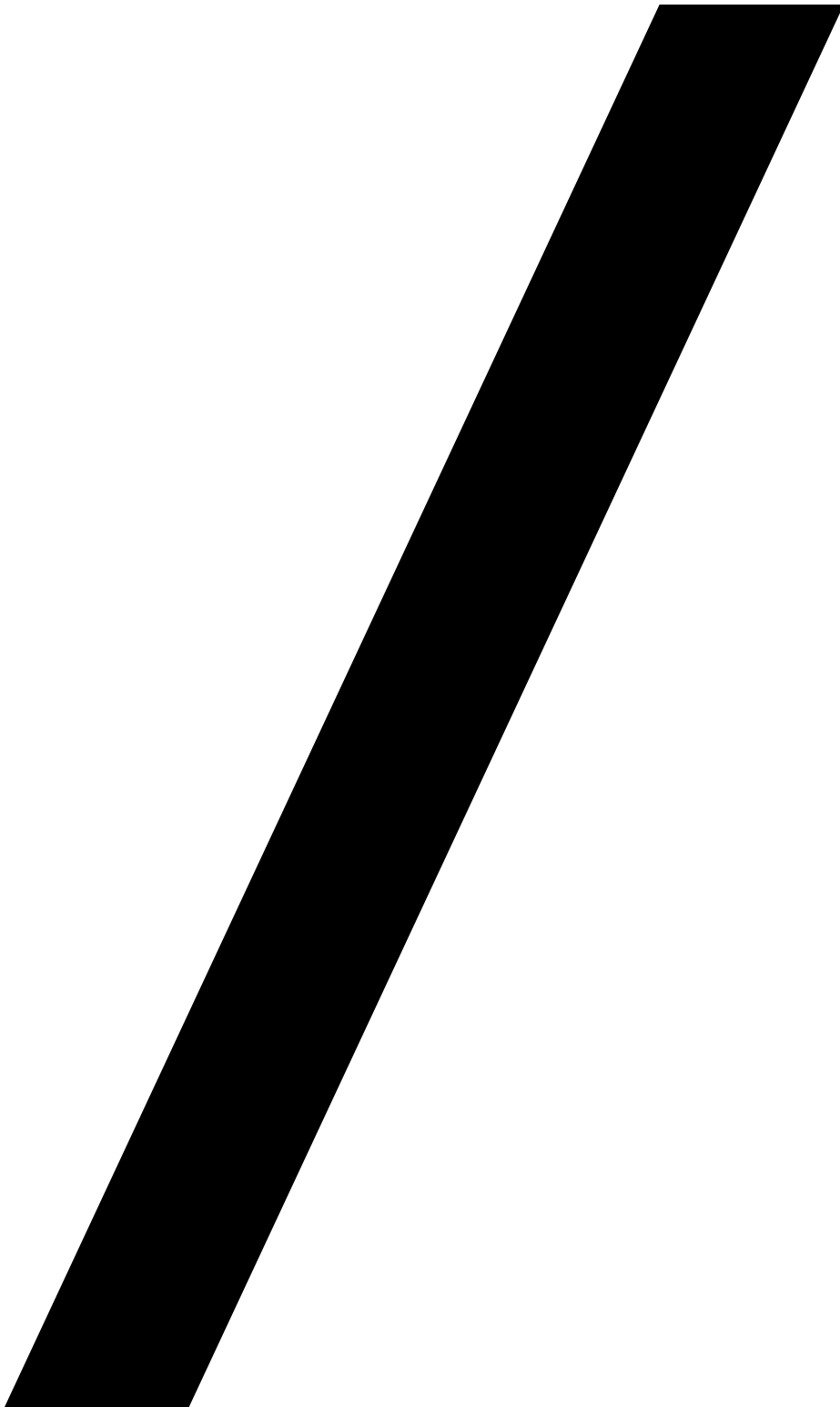
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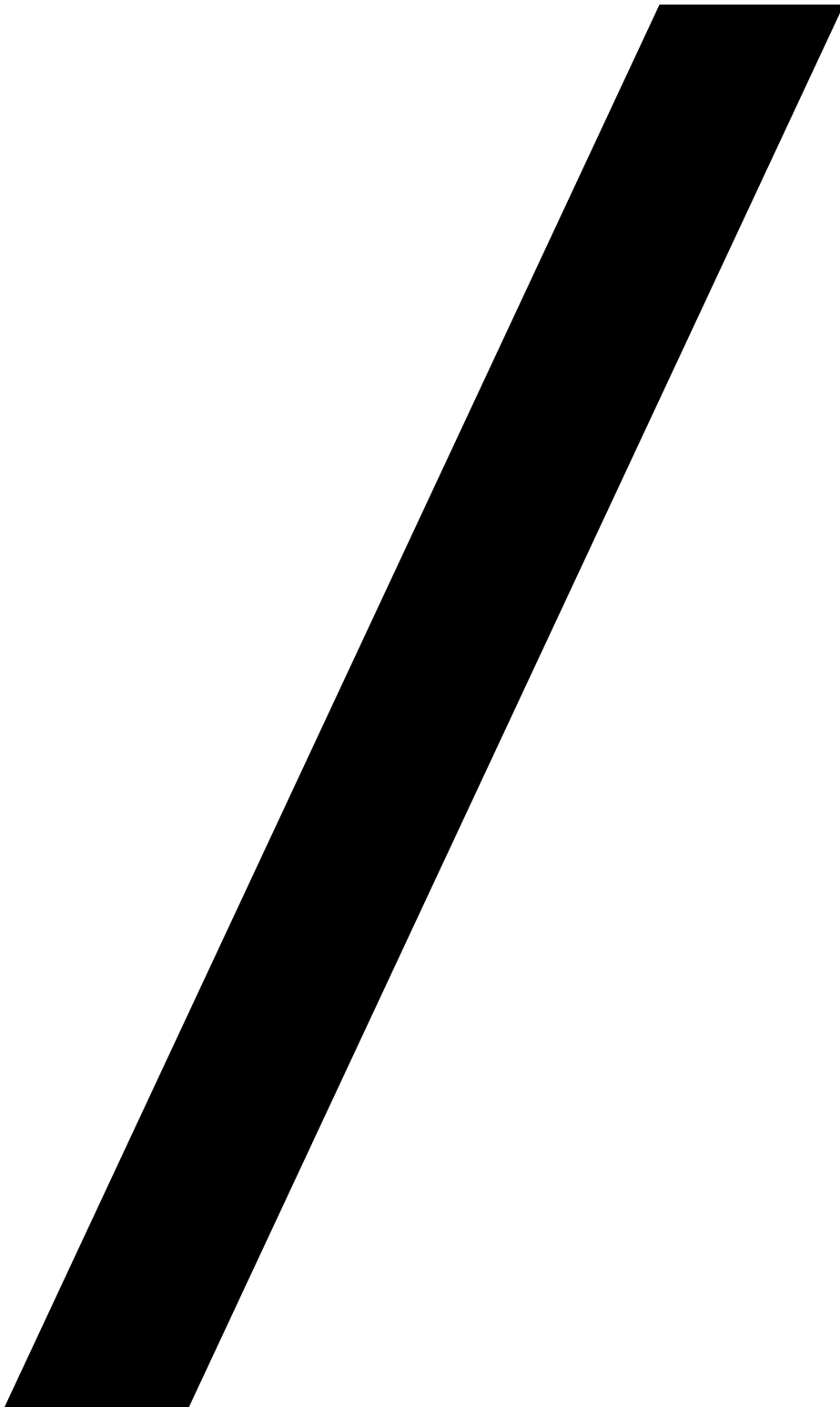




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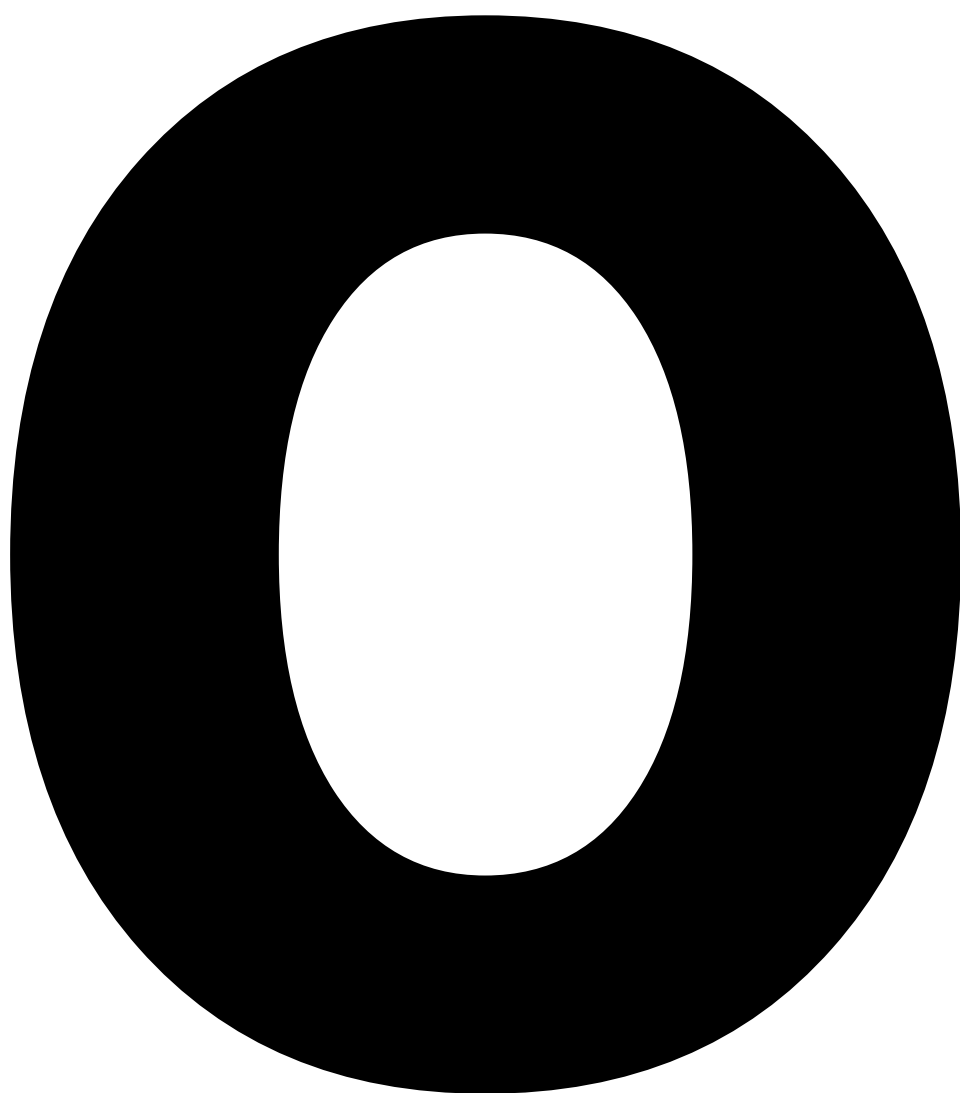
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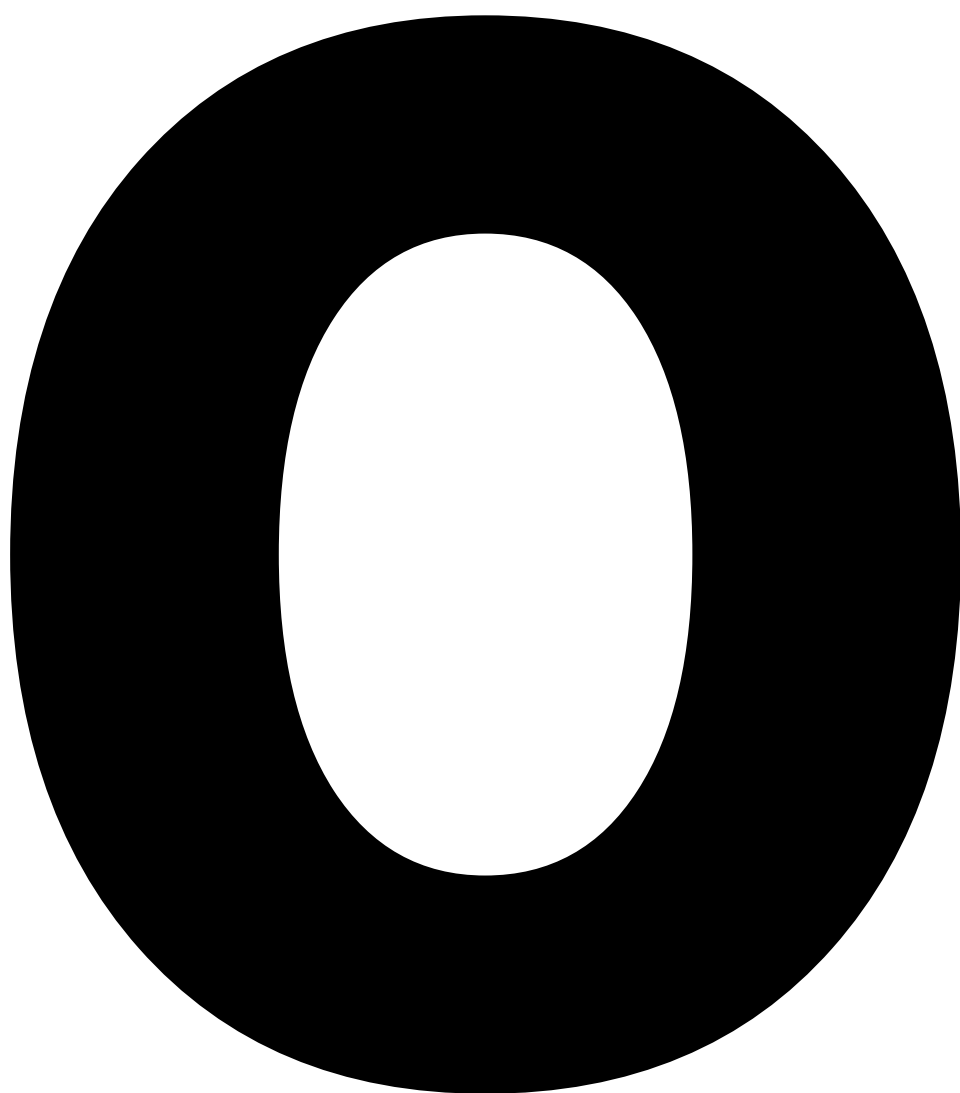
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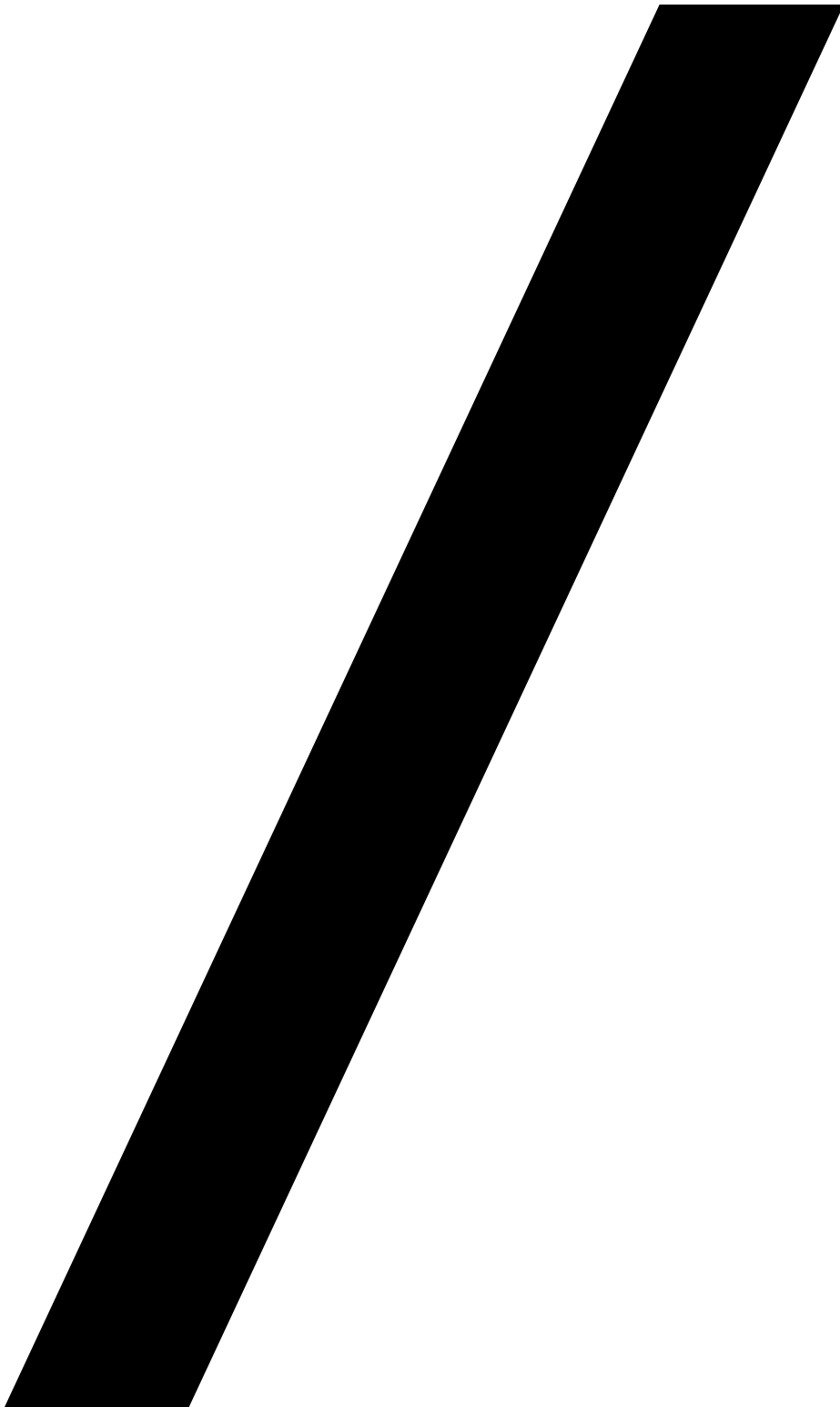
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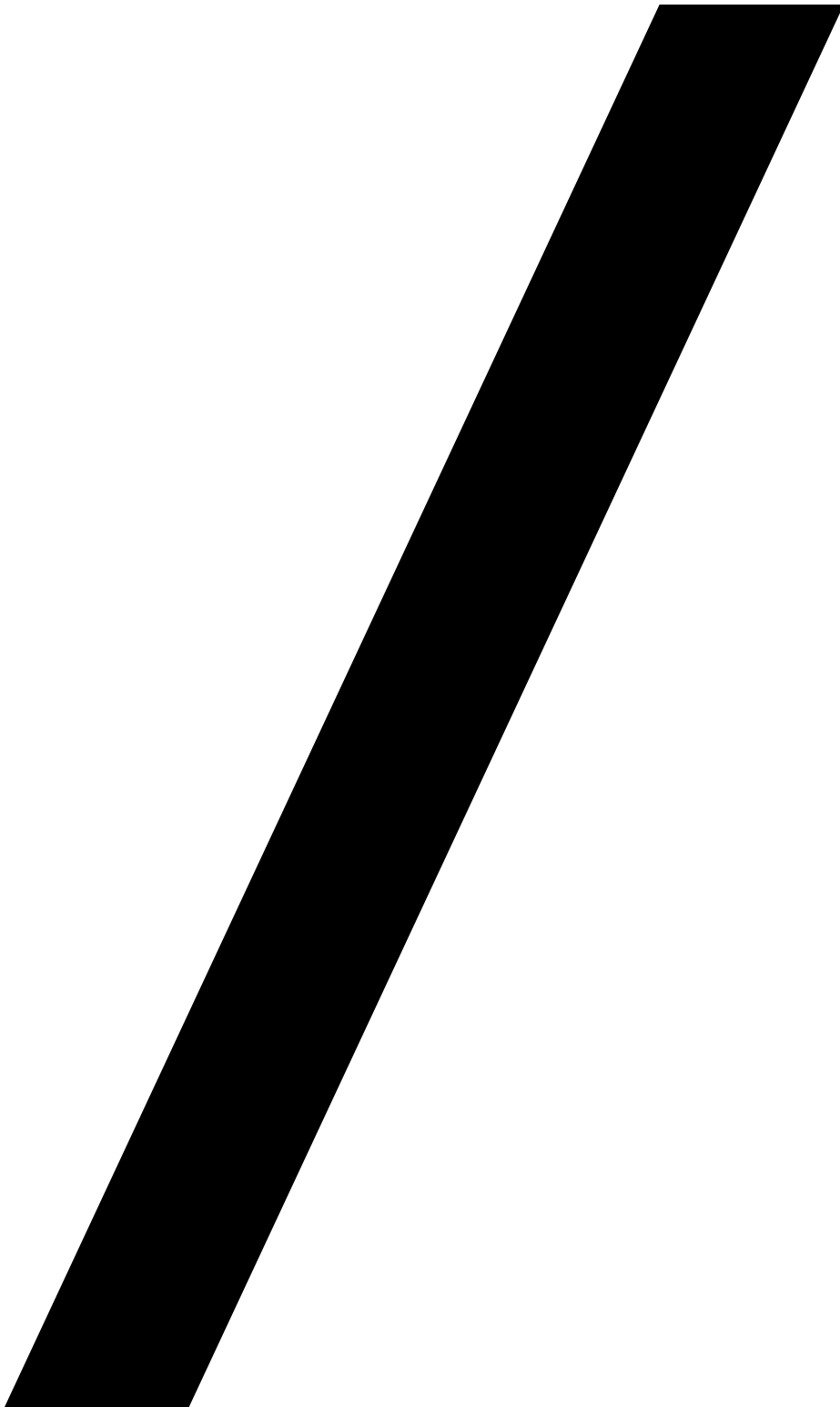
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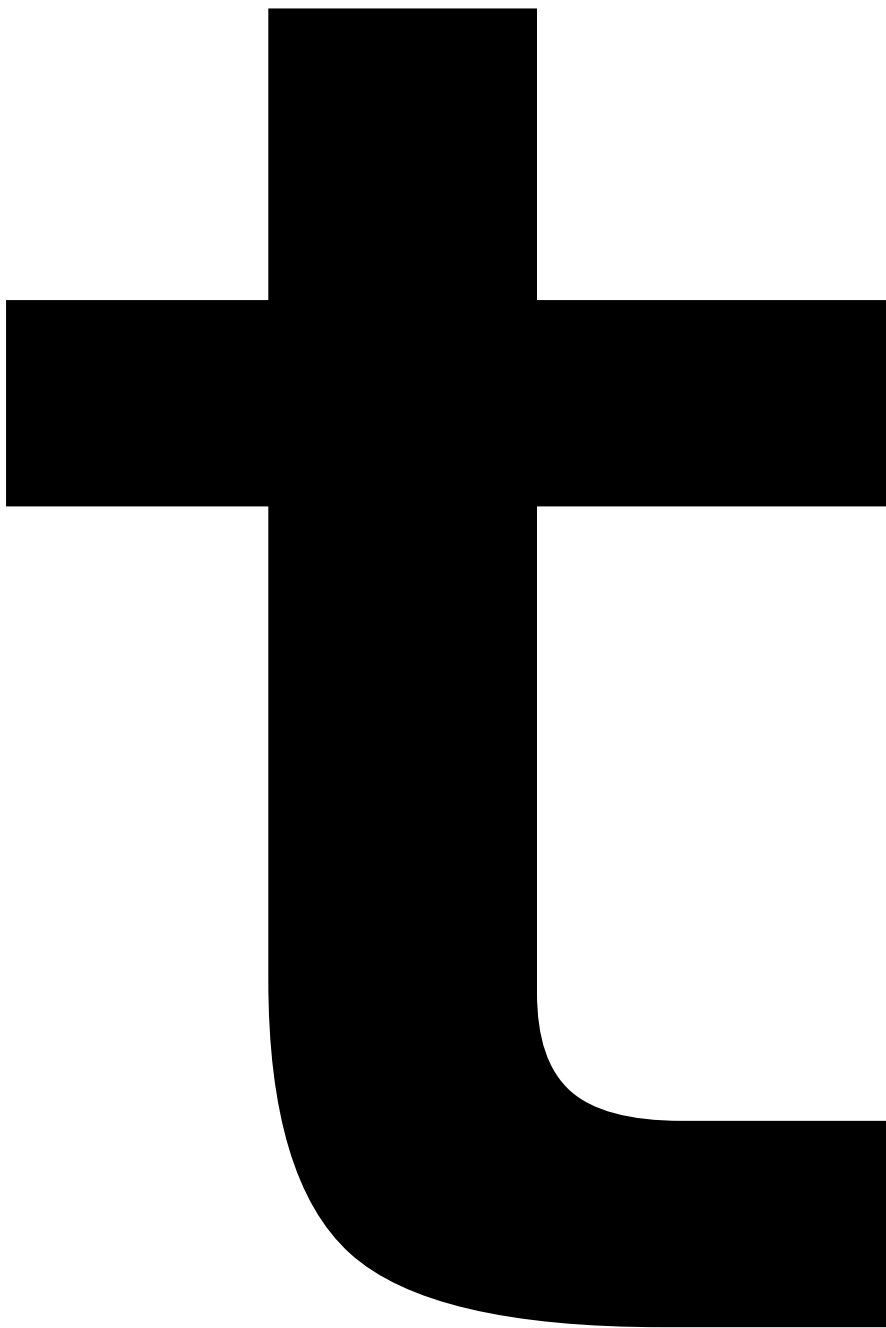
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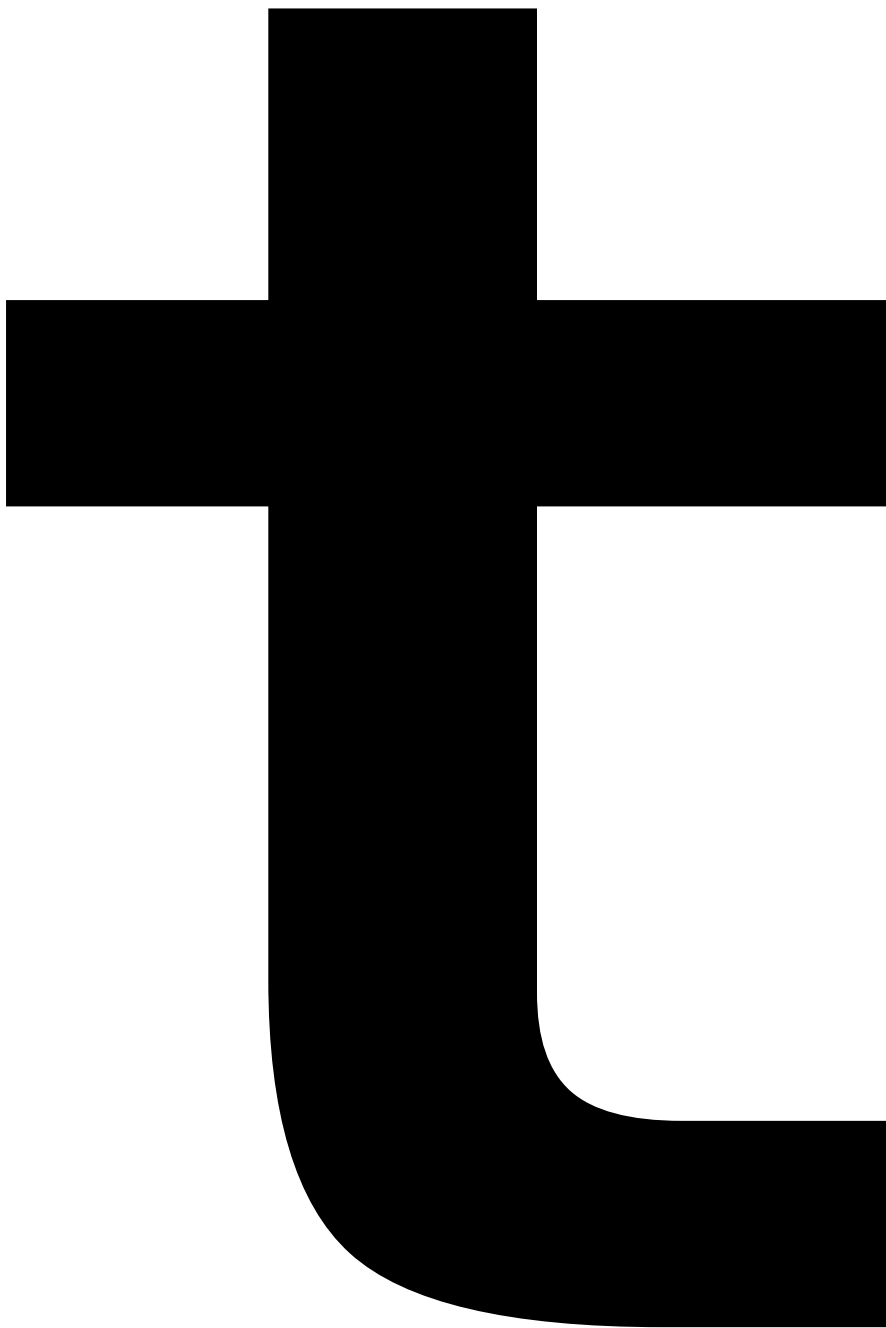
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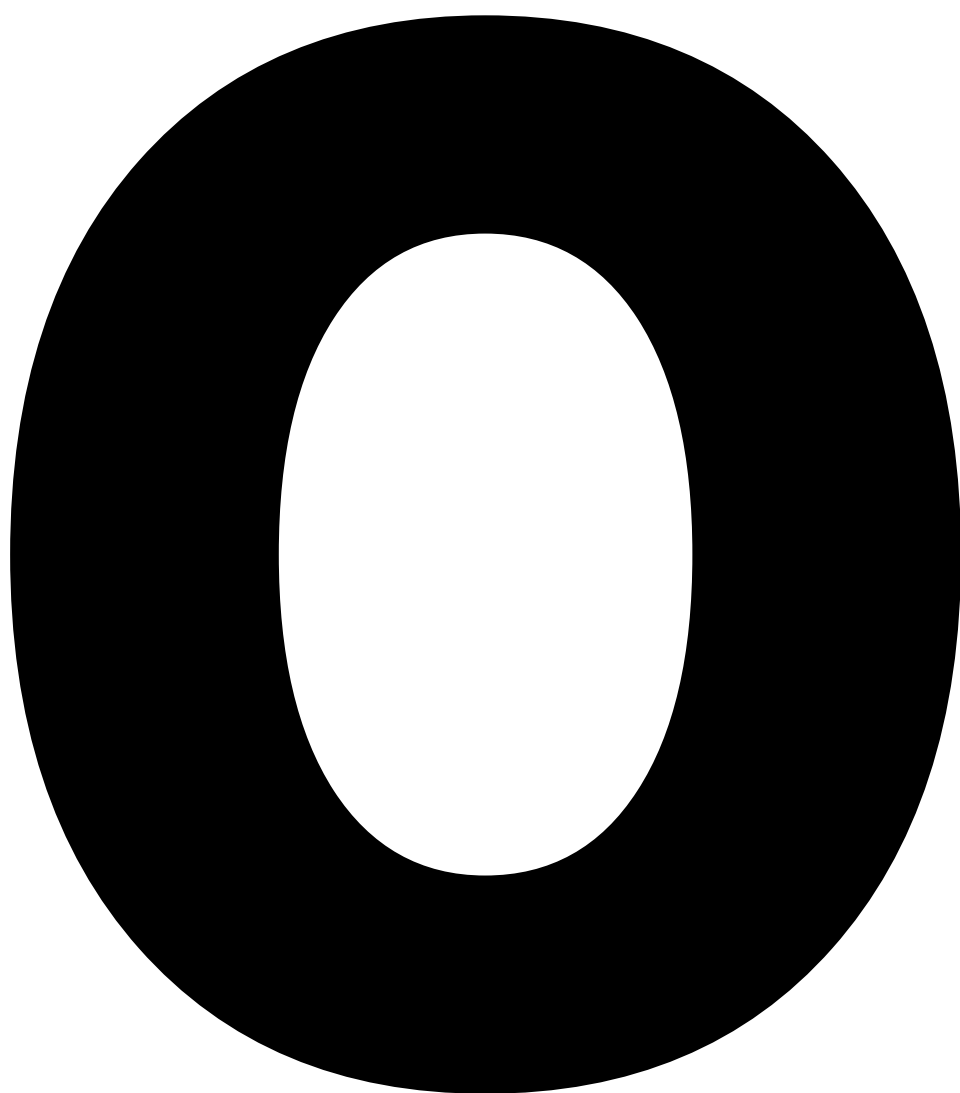
GAS	Pre-1750 tropospheric concentration ¹	Recent tropospheric concentration ²	GWP ³ (100-yr time horizon)	Atmospheric lifetime ⁴ (years)	Increased radiative forcing ⁵ (W/m ²)
Concentrations in parts per million (ppm)					
Carbon dioxide (CO ₂)	280 ⁶	390.5 ⁷	1	~ 100 ⁴	1.79
Concentrations in parts per billion (ppb)					
Methane (CH ₄)	700 ⁸	1871 ⁹ /1750 ⁹	25	12 ⁴	0.50
Nitrous oxide (N ₂ O)	270 ¹⁰	323 ⁹ /322 ⁹	298	114 ⁴	0.18
Tropospheric ozone (O ₃)	25 ¹	34 ^{4.1}	n.a. ⁴	hours-days	0.35 ⁴

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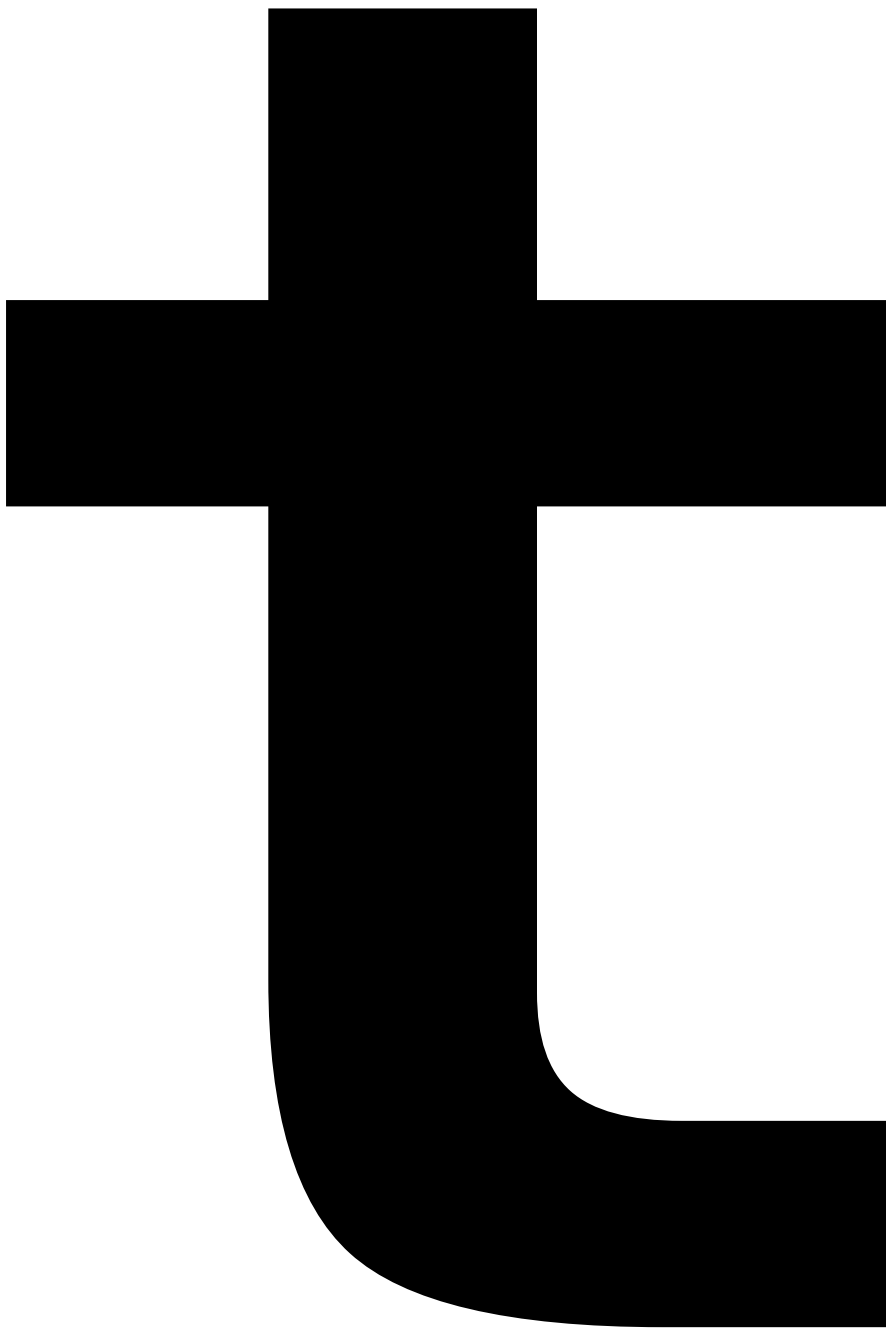


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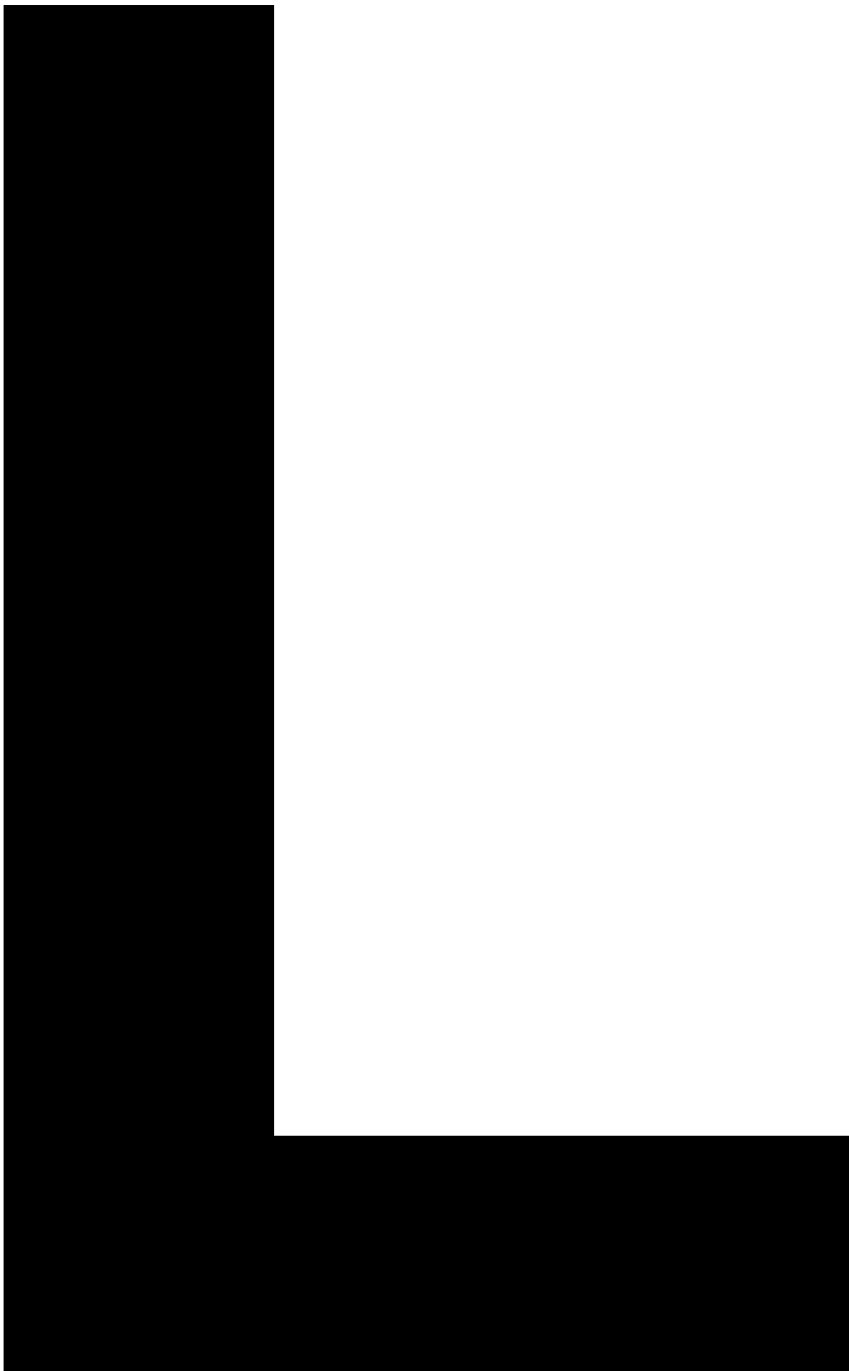
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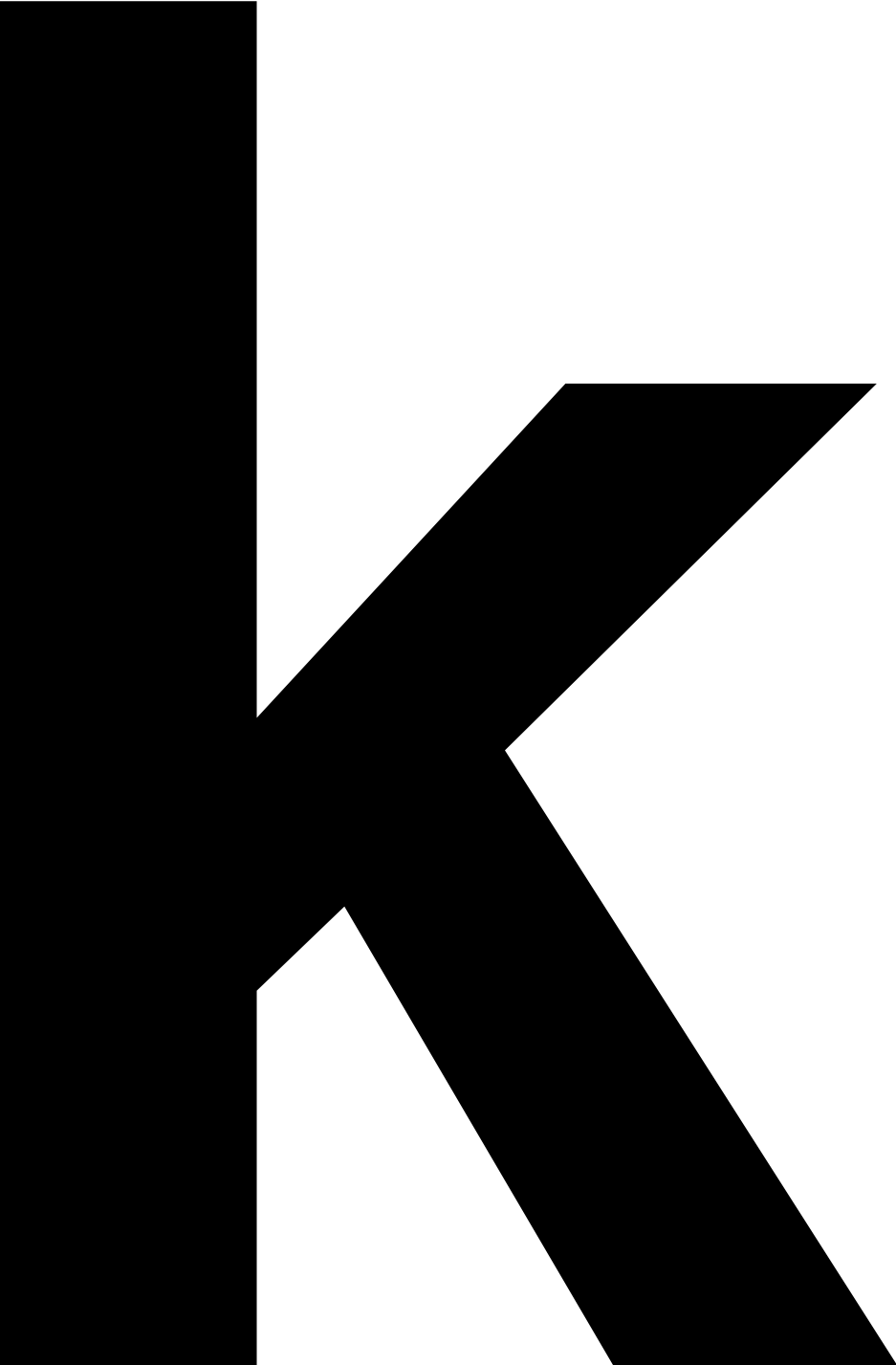


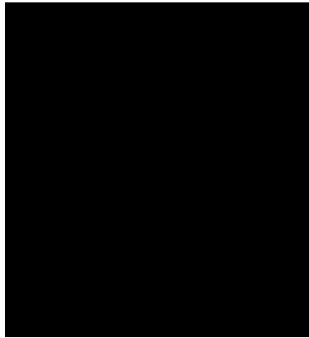
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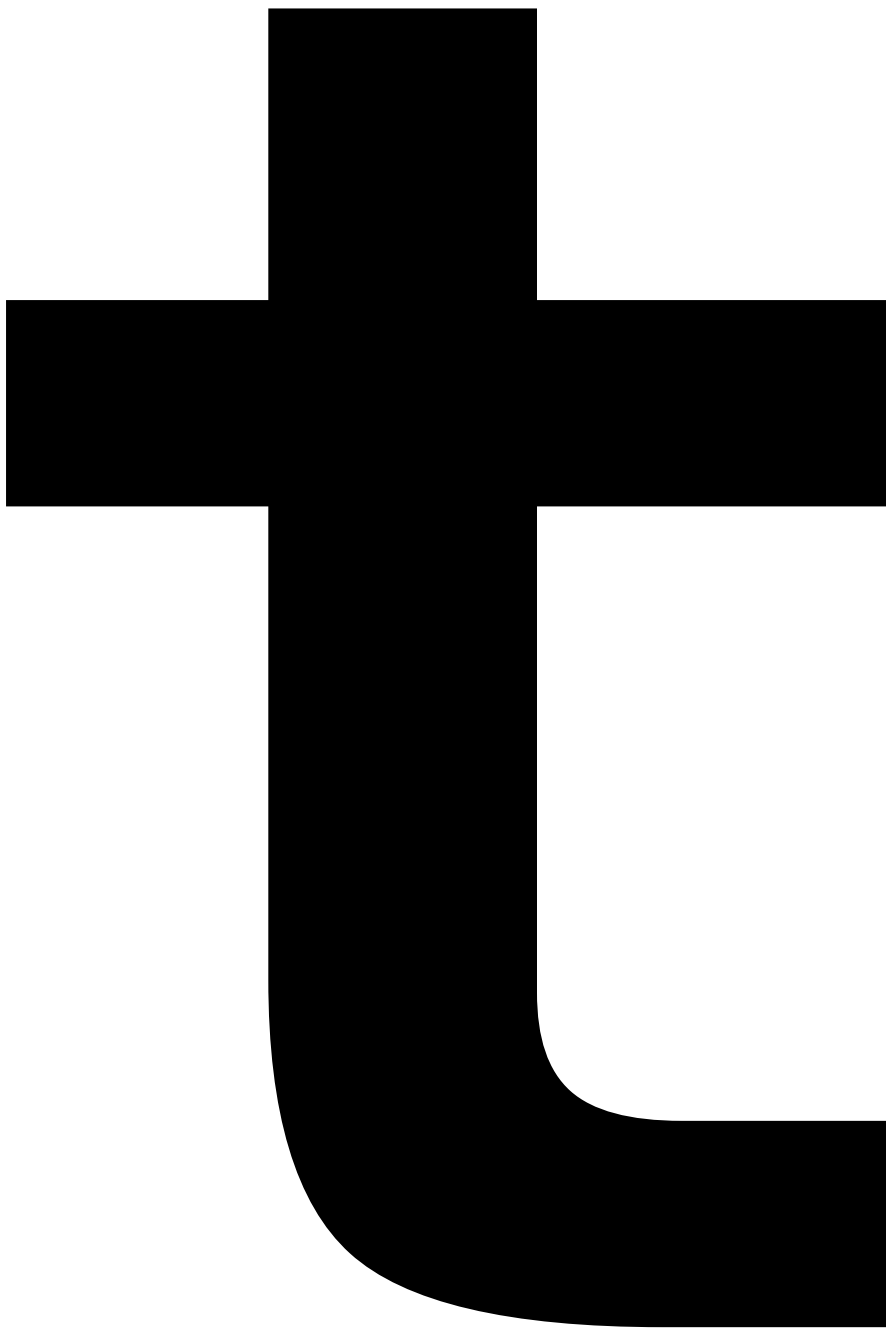


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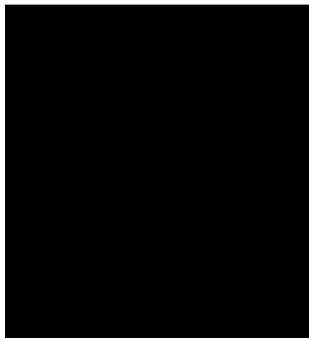
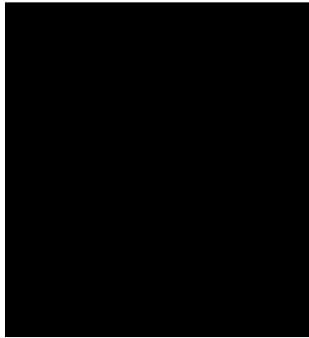


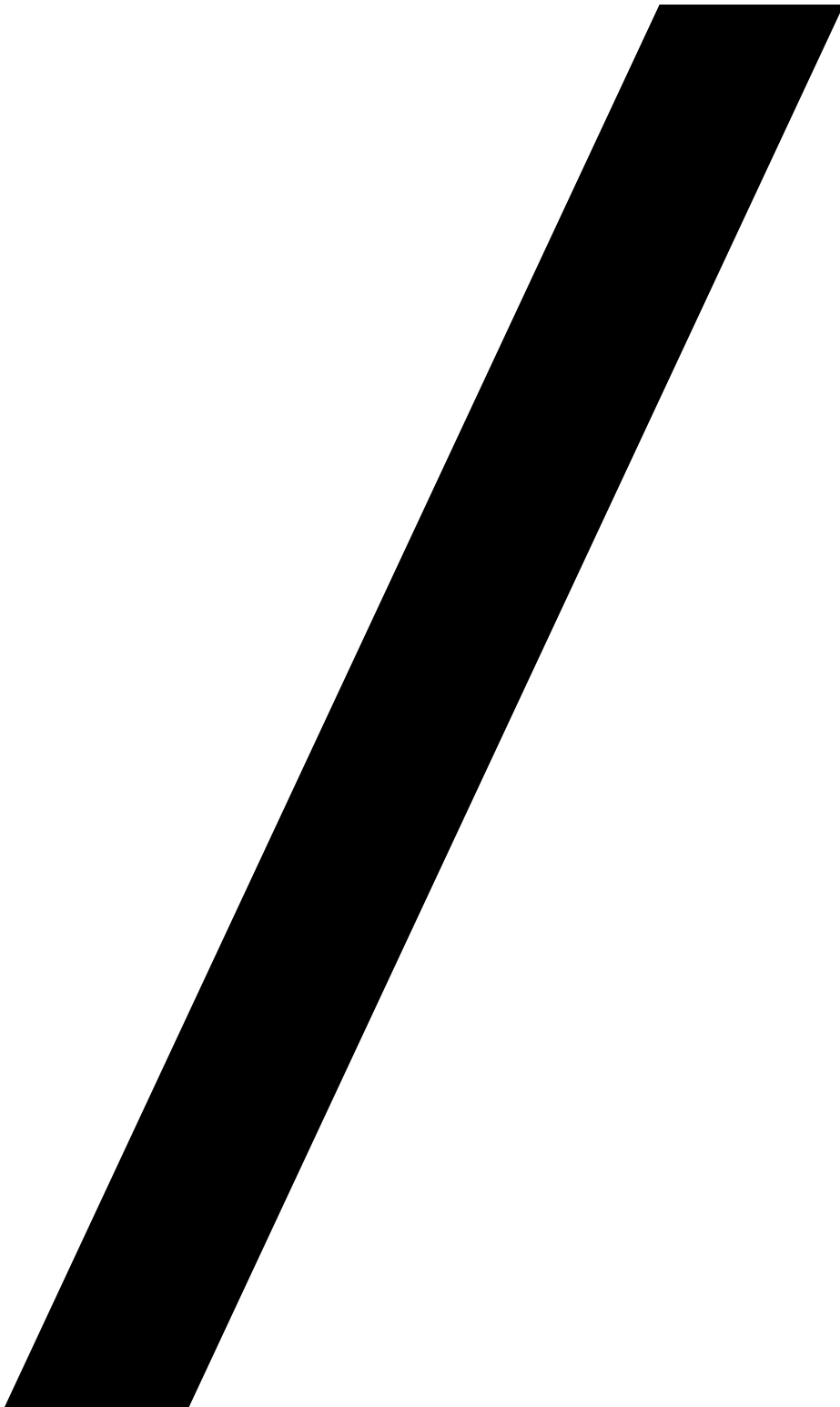
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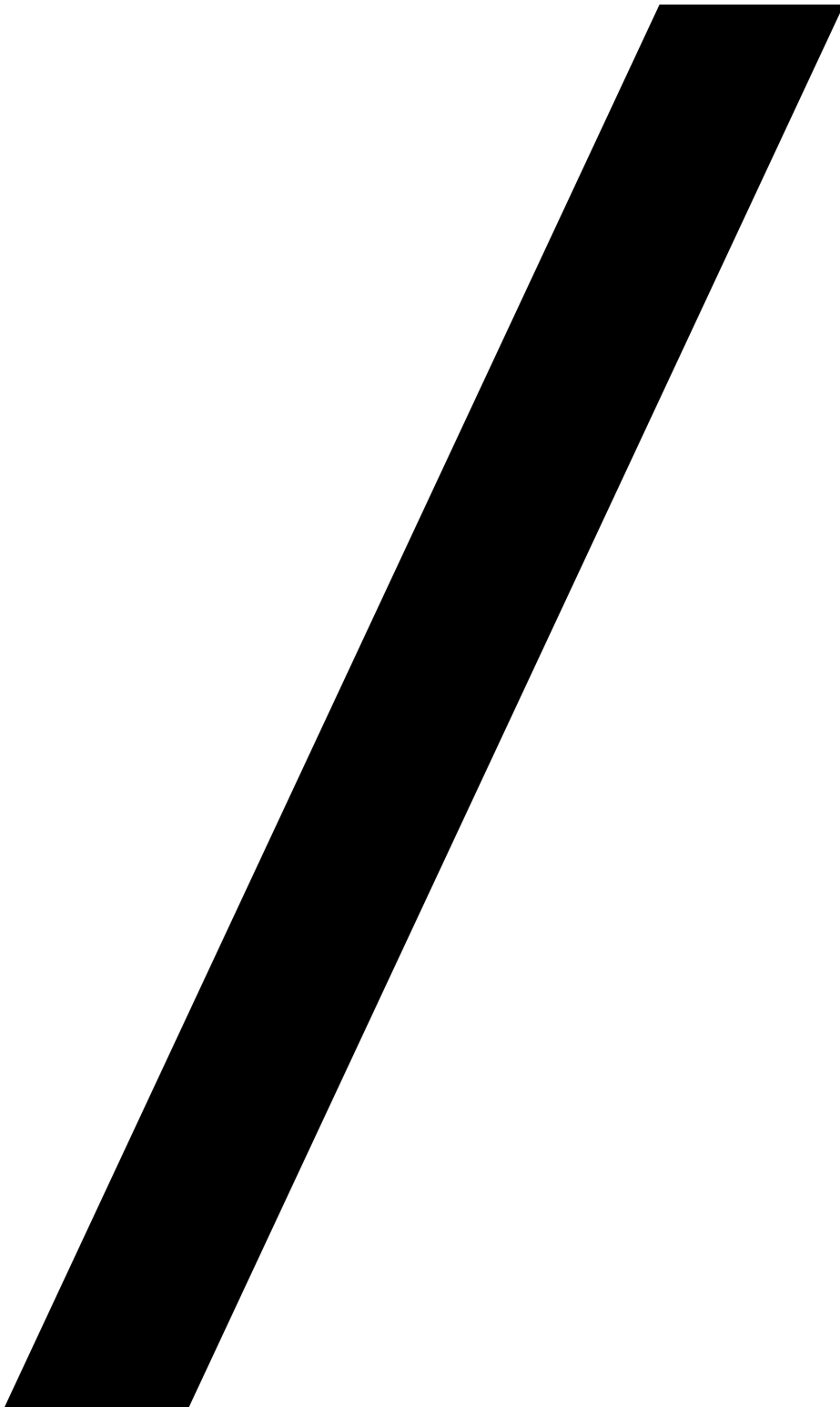




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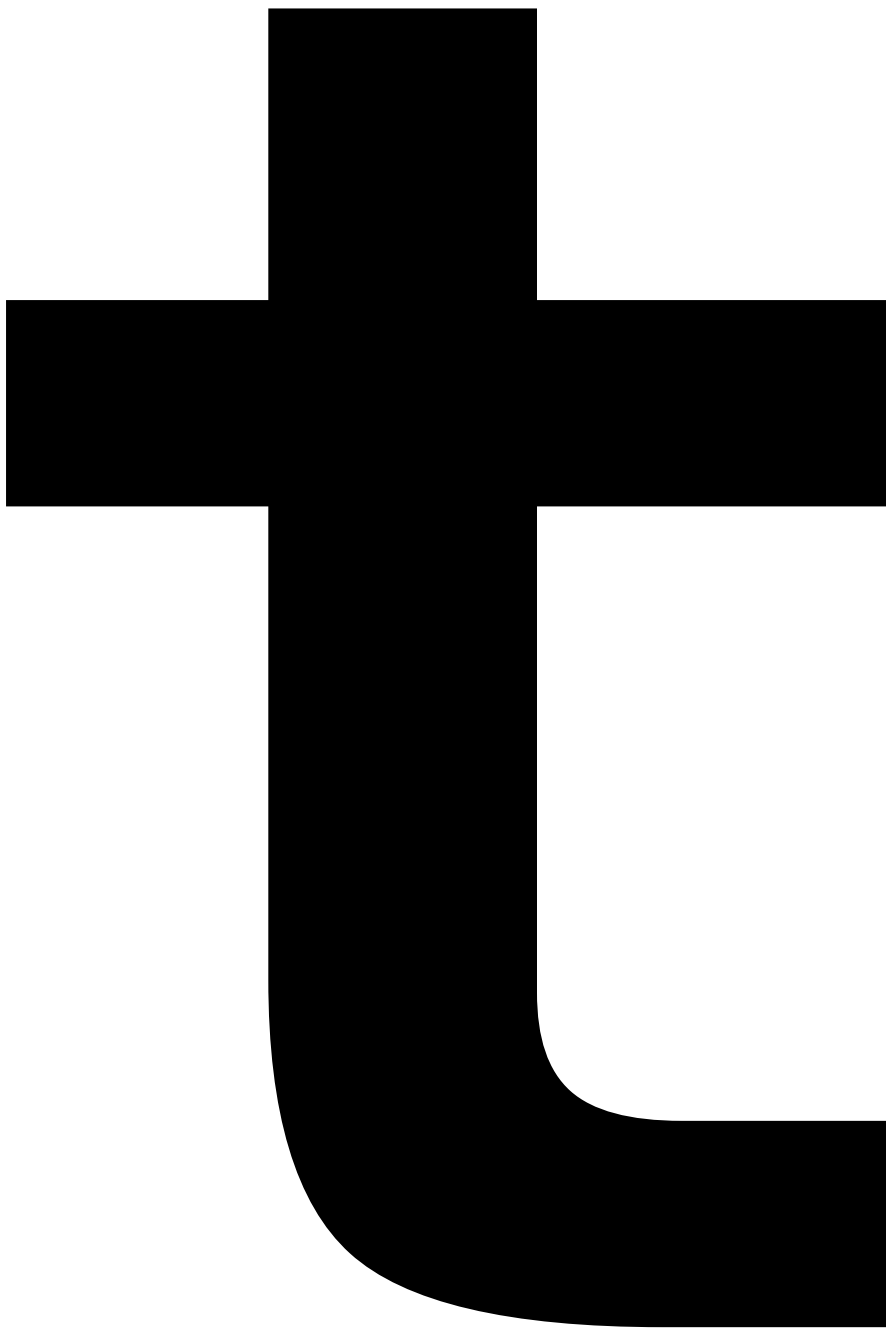


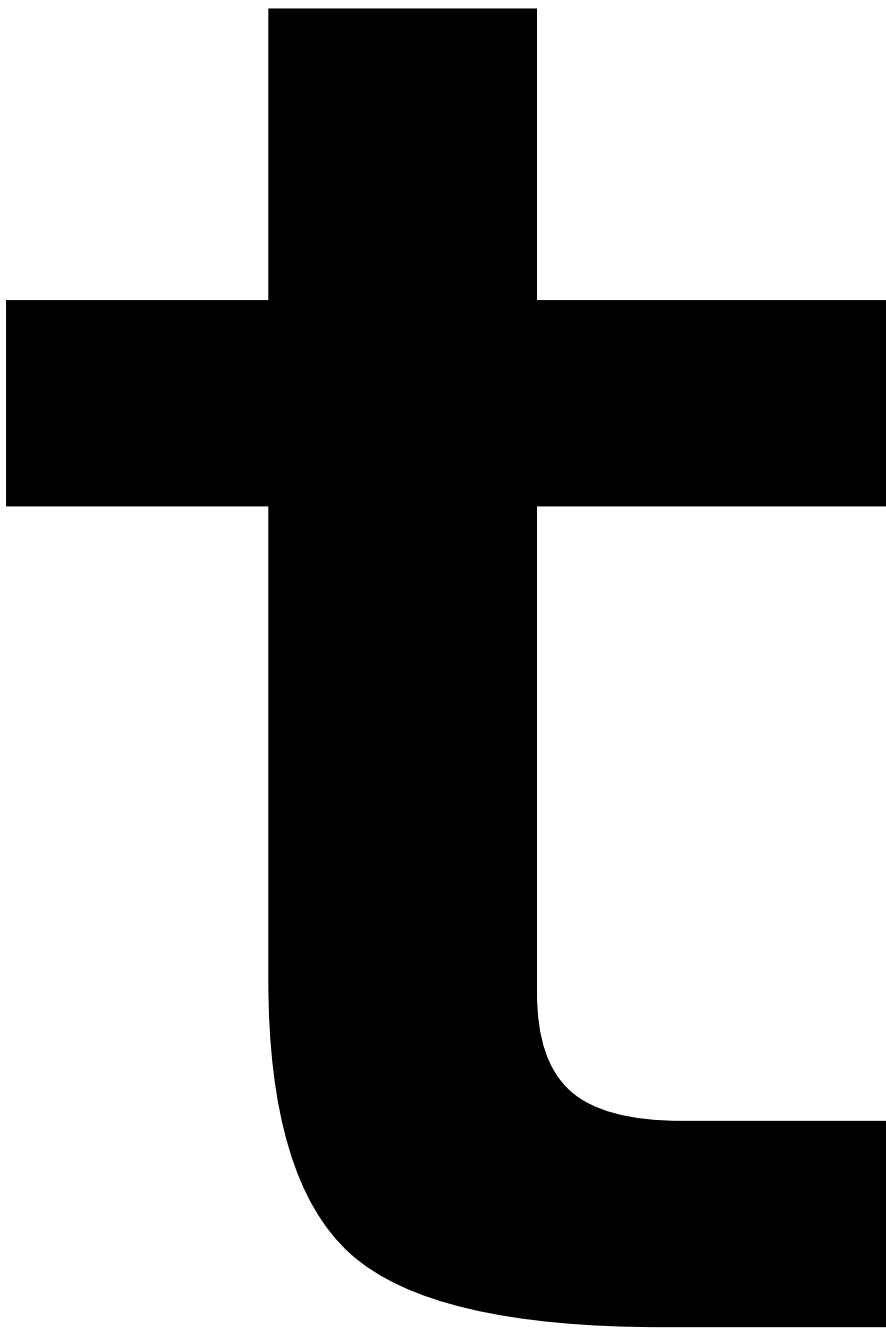




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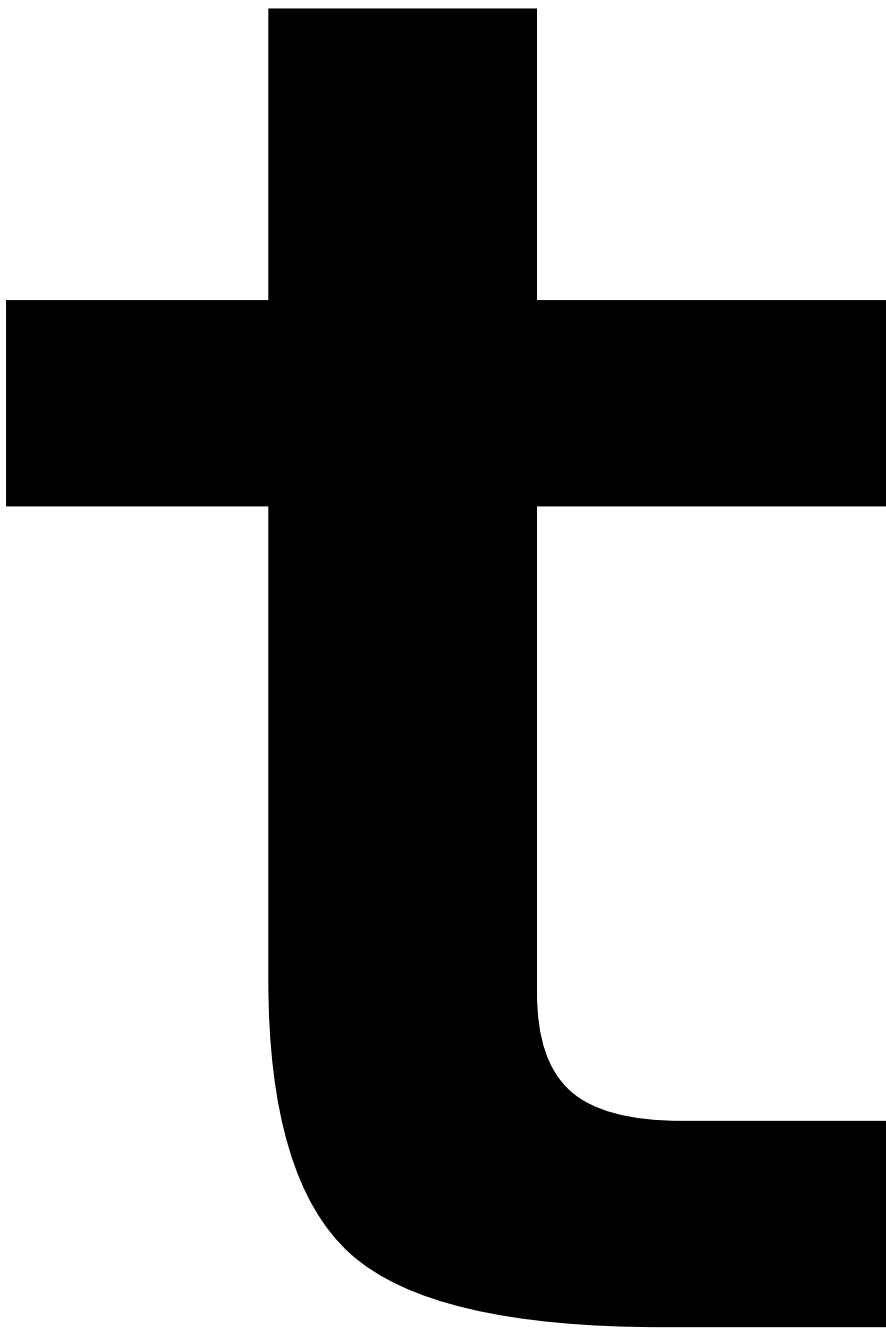
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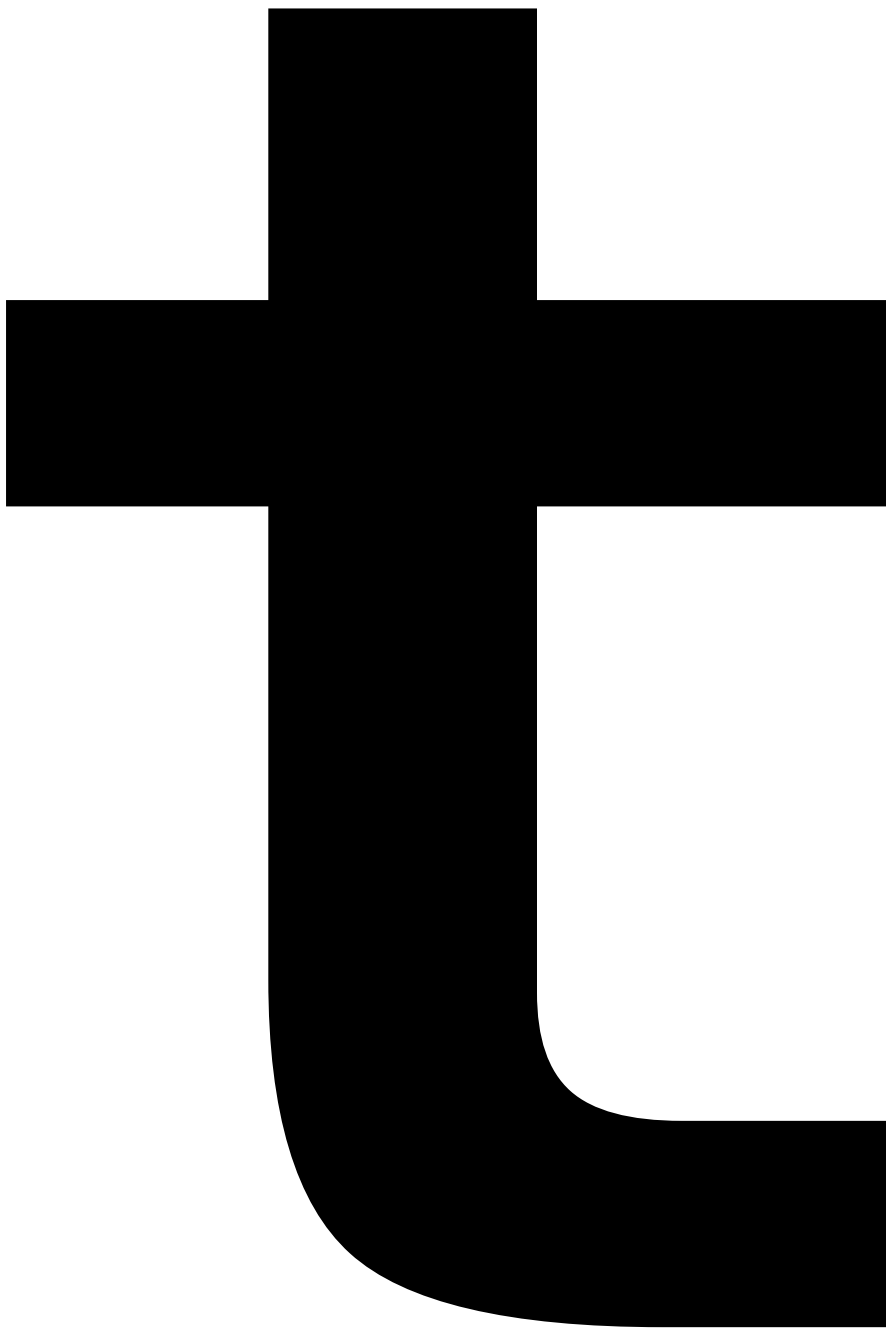


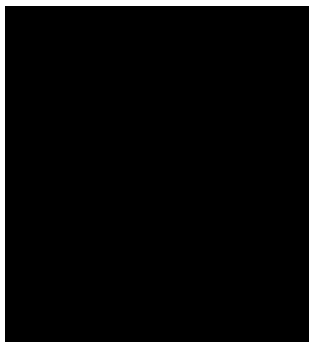
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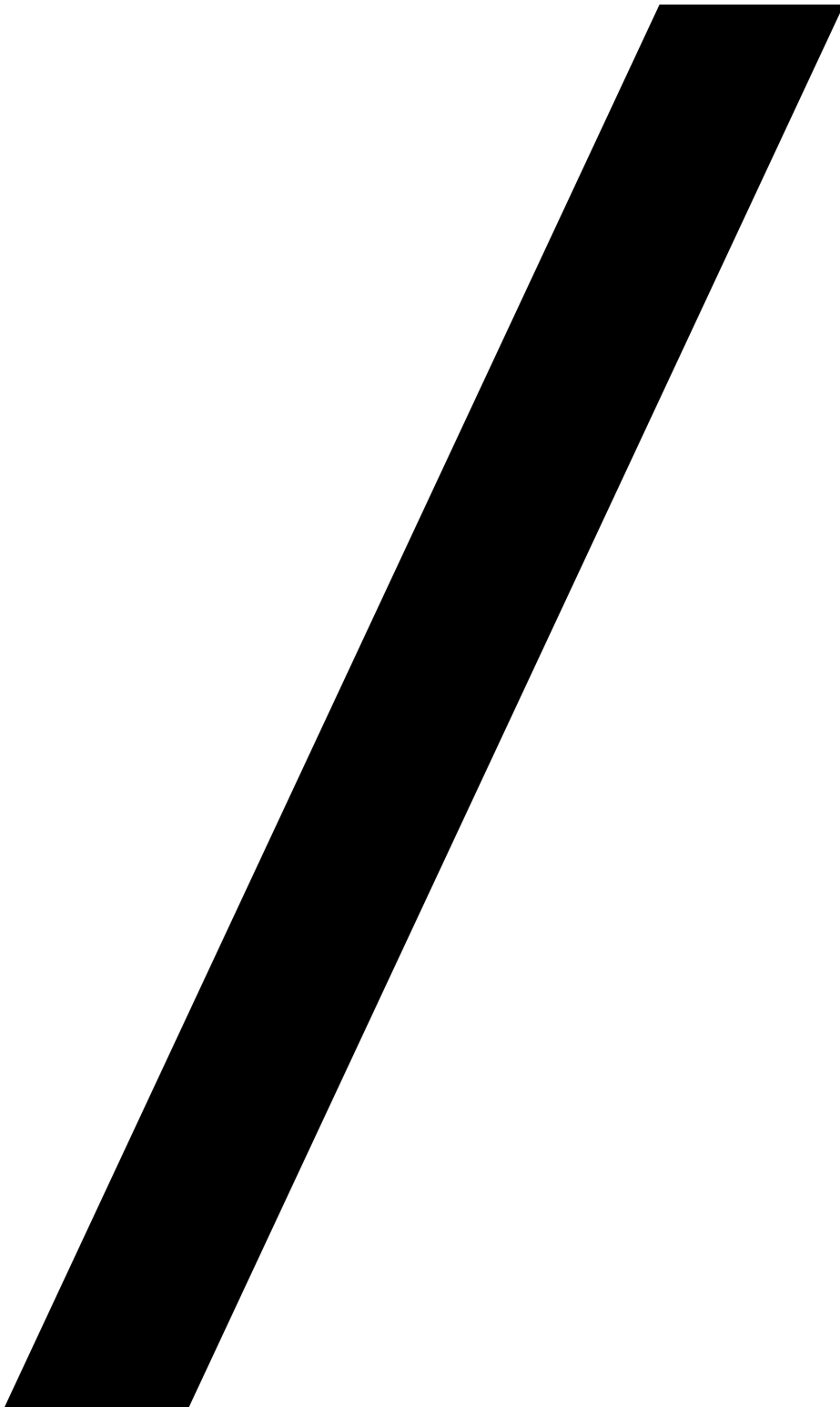




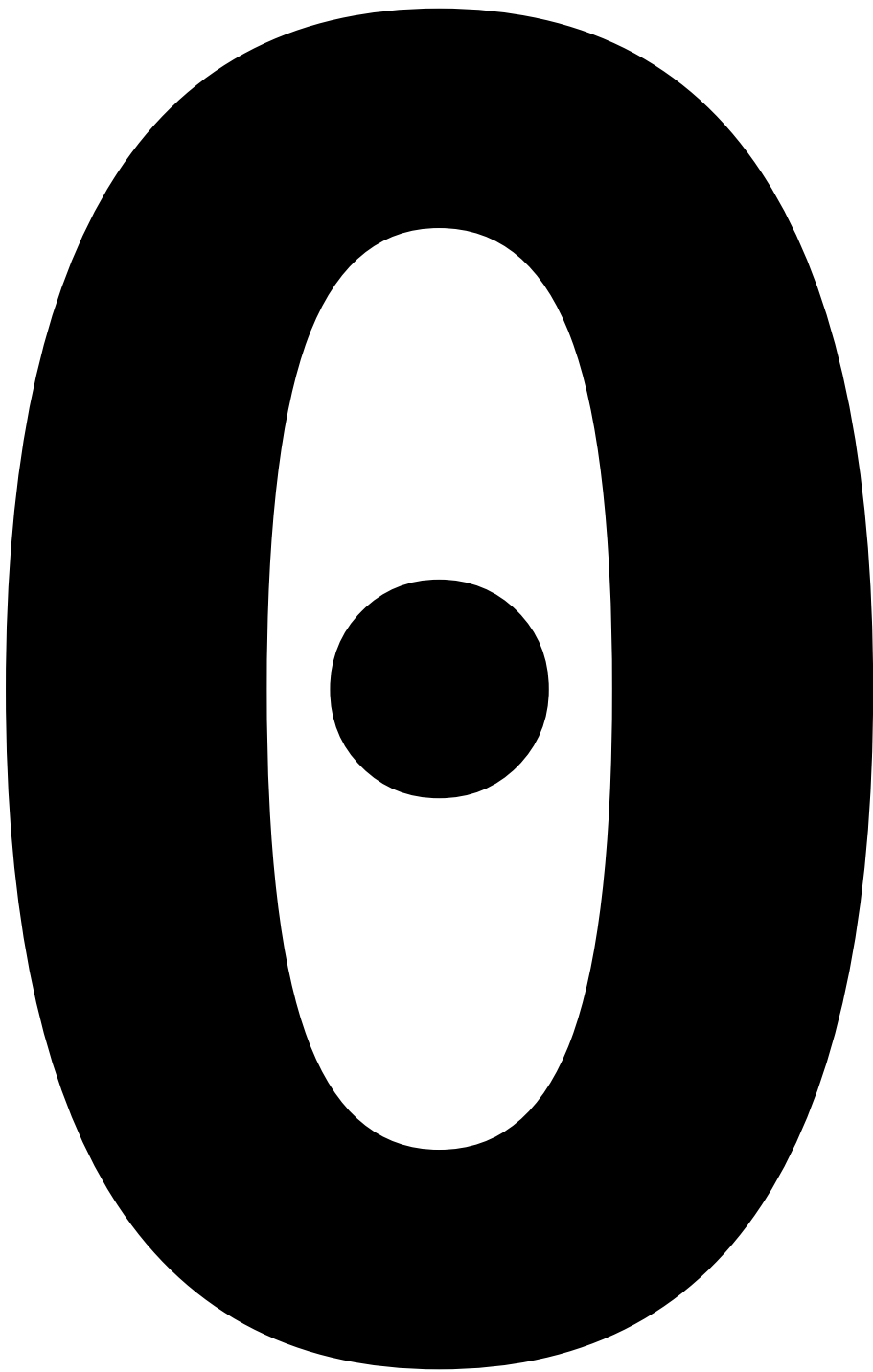
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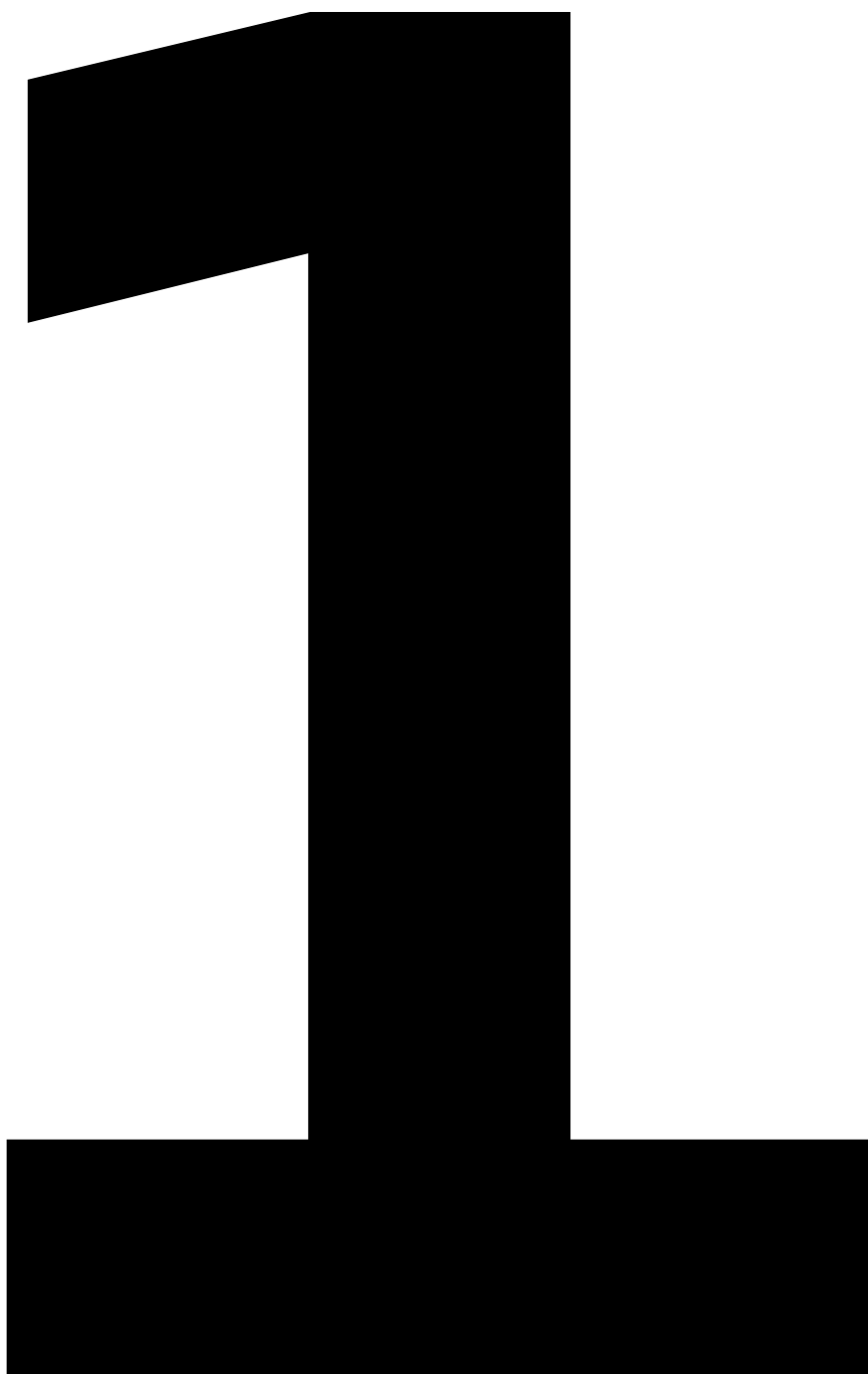


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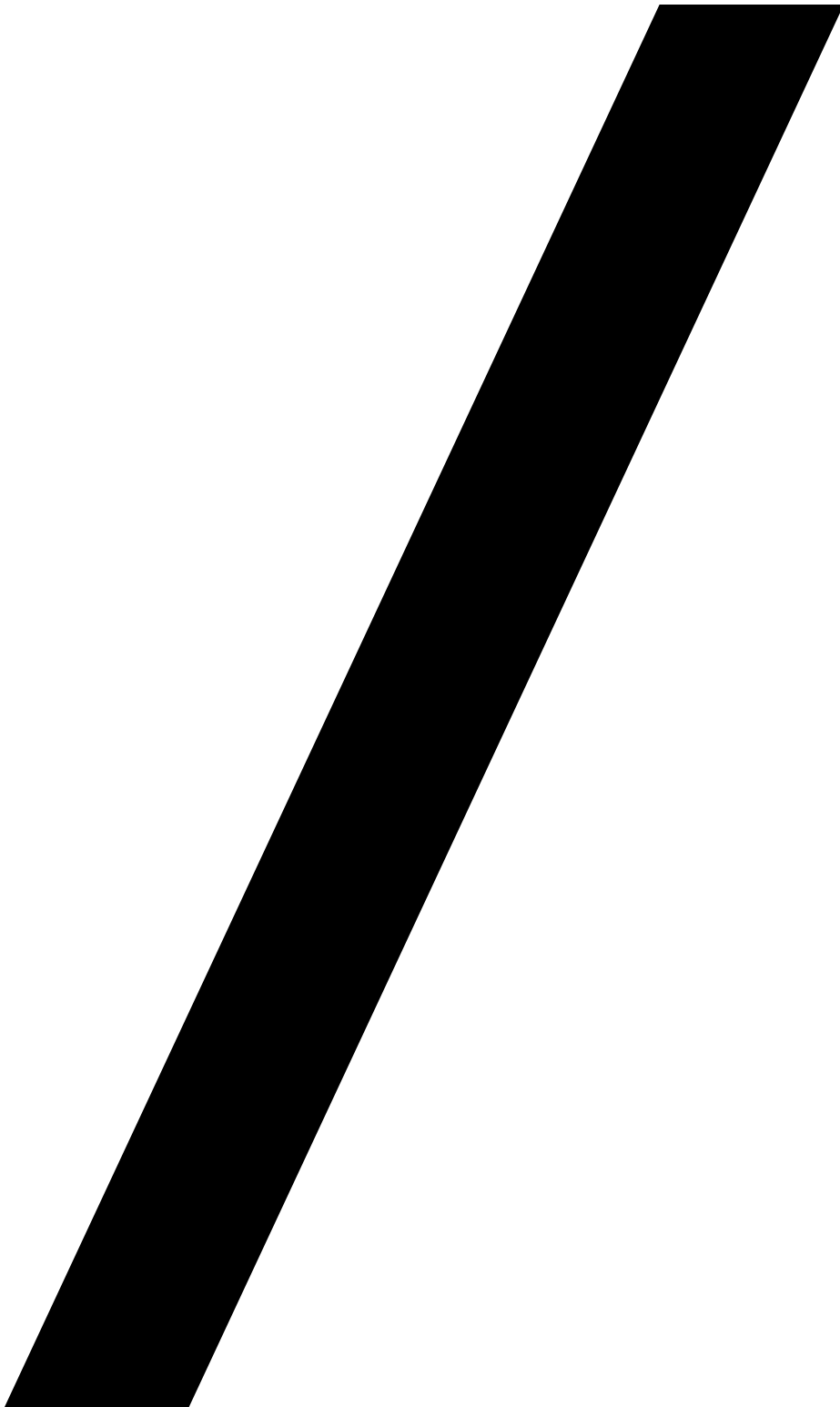


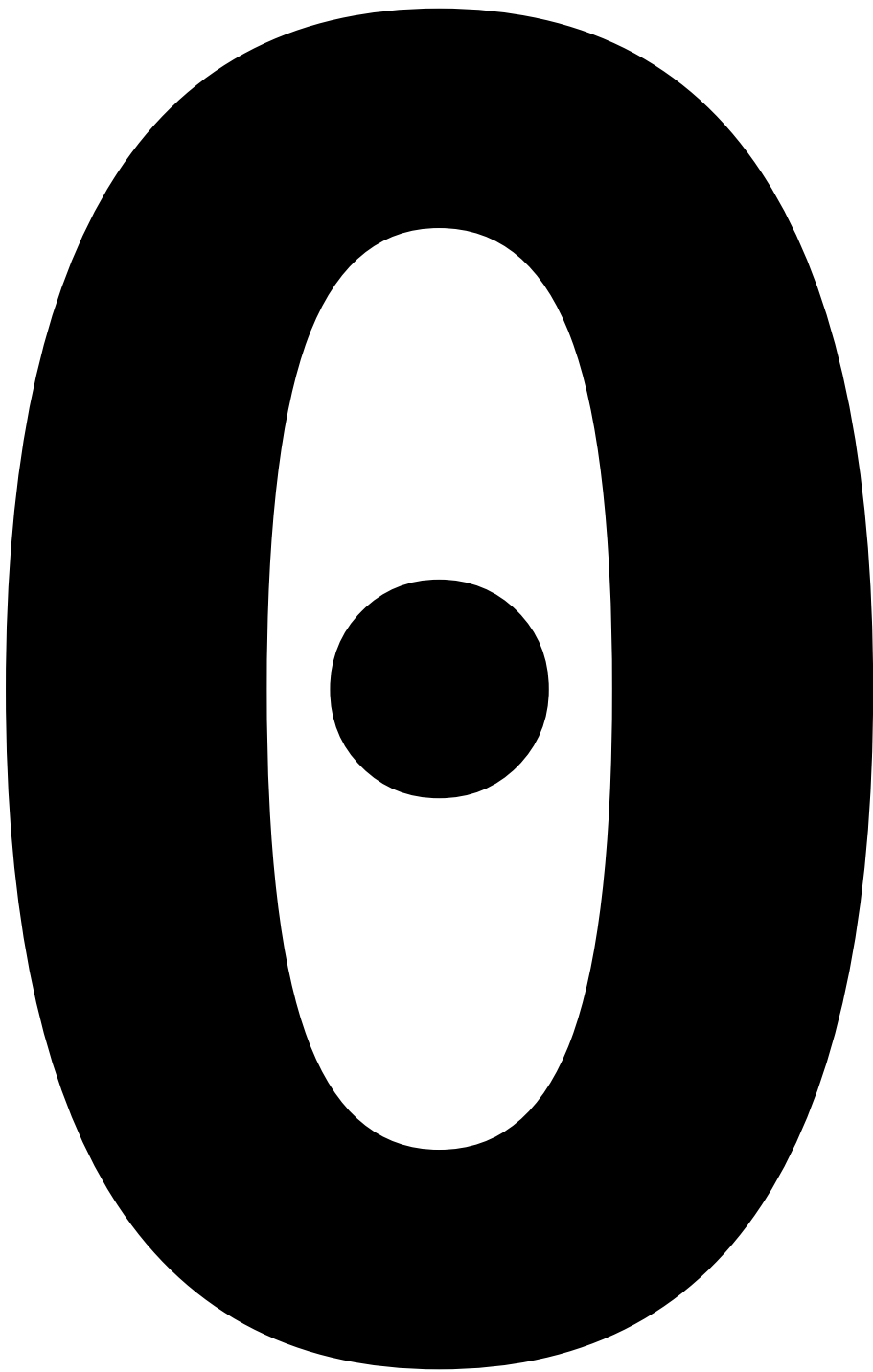
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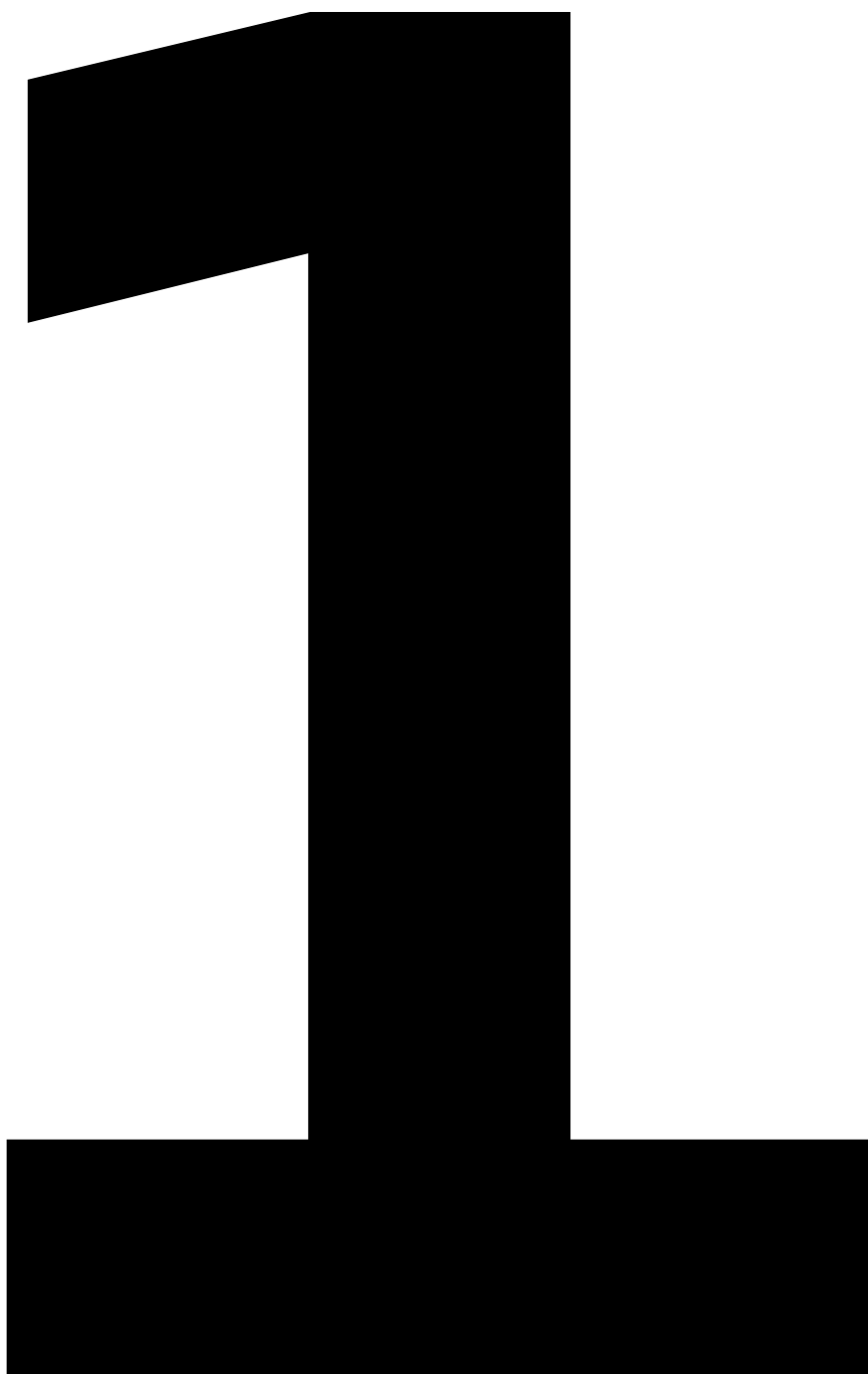


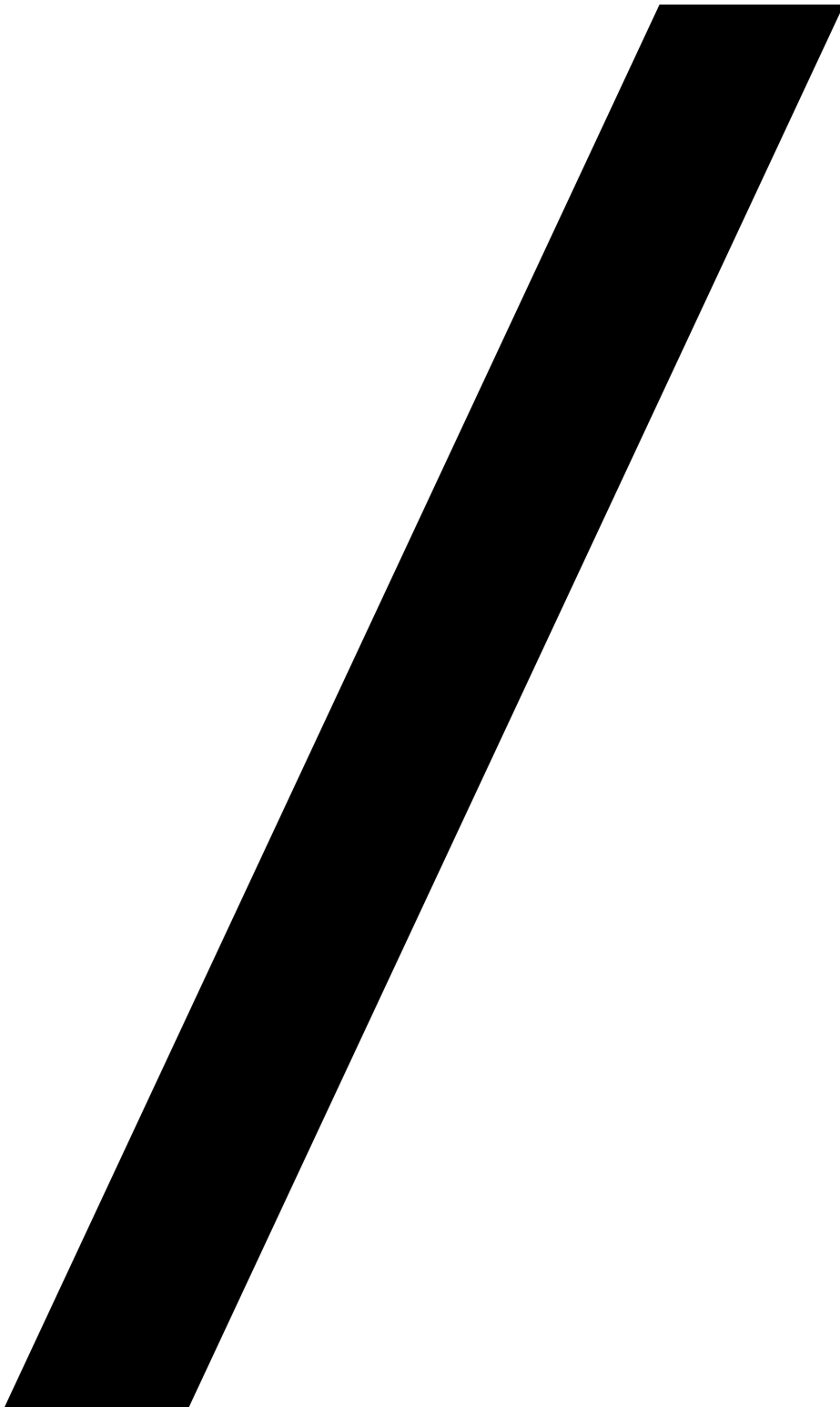


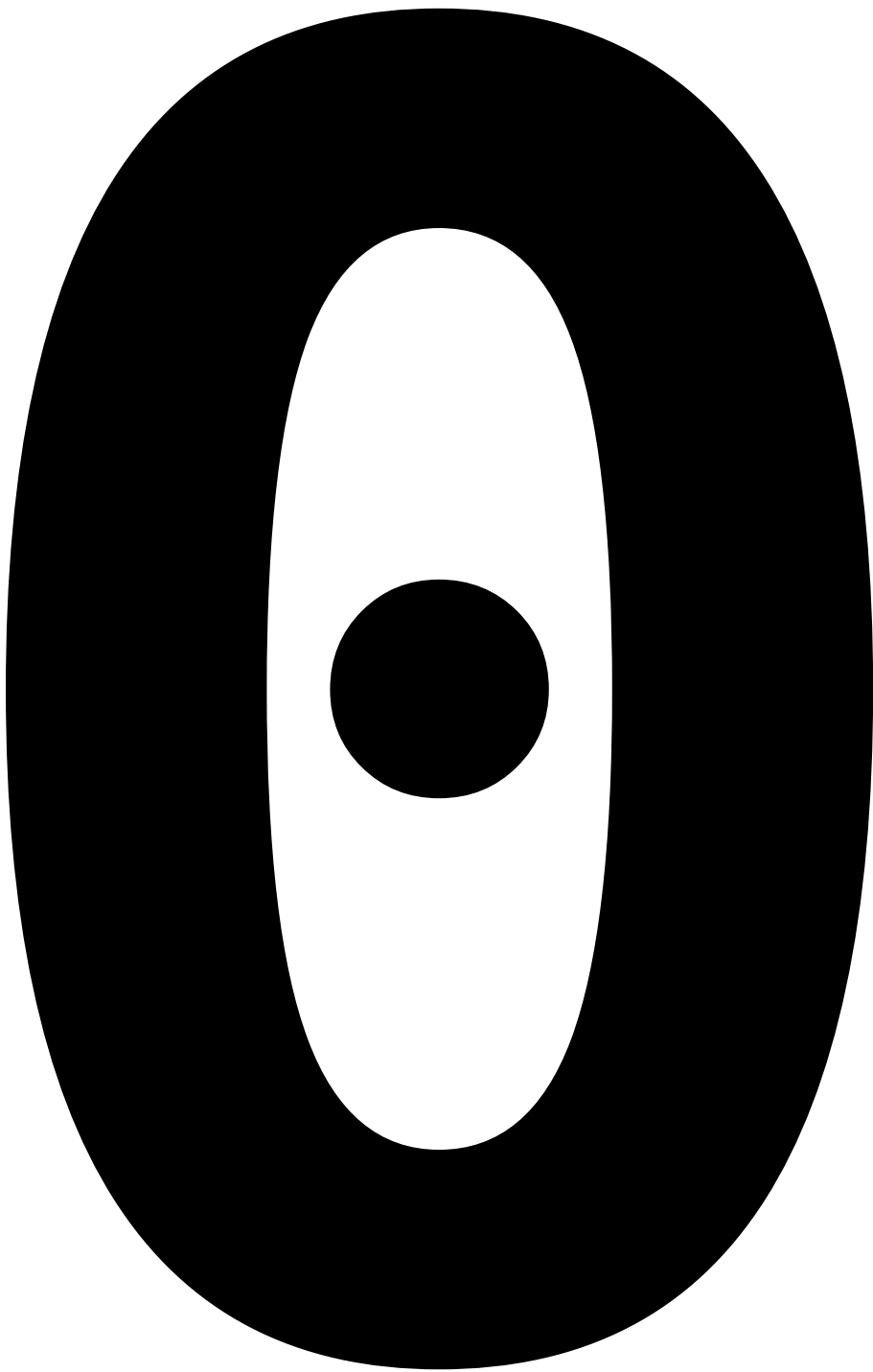
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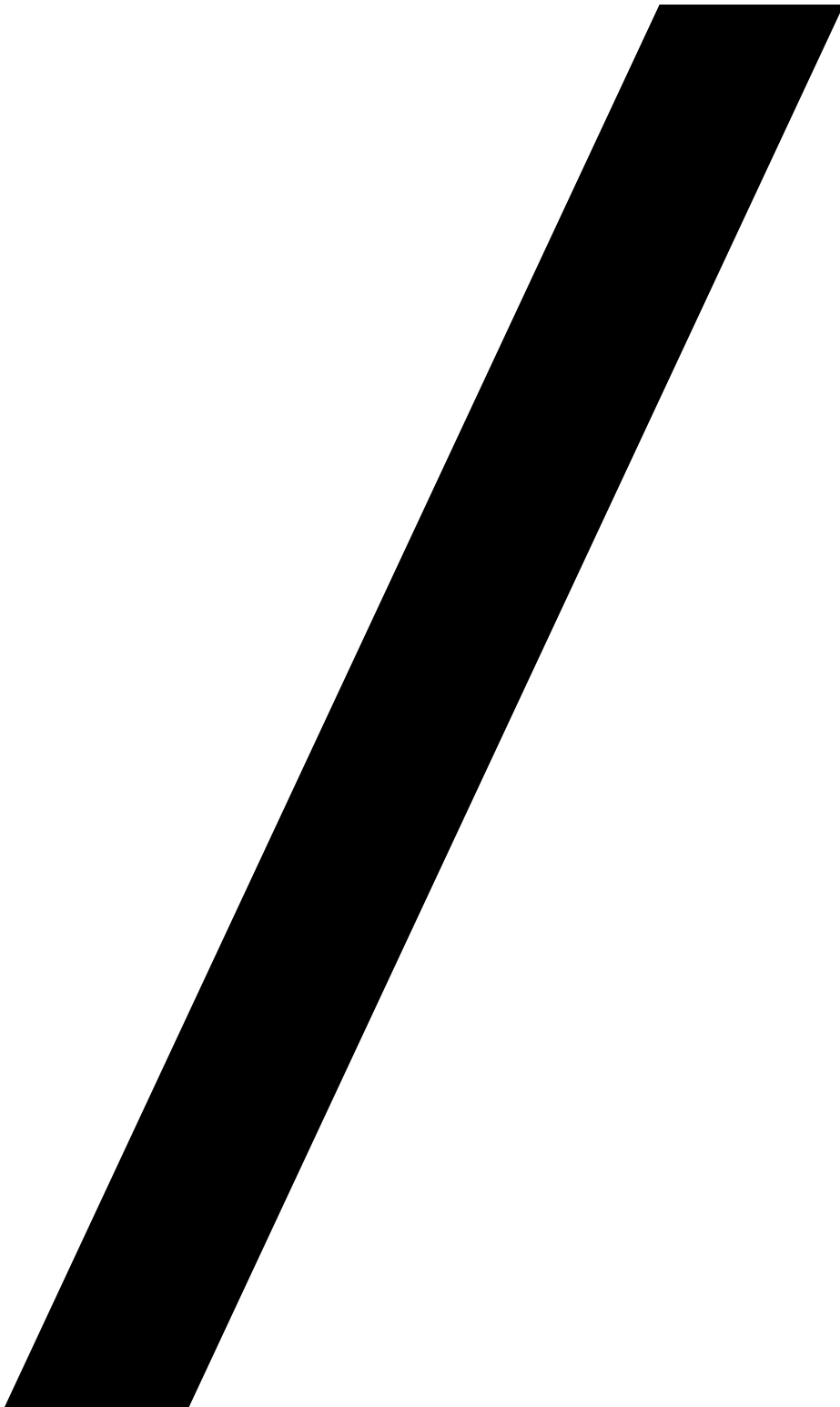








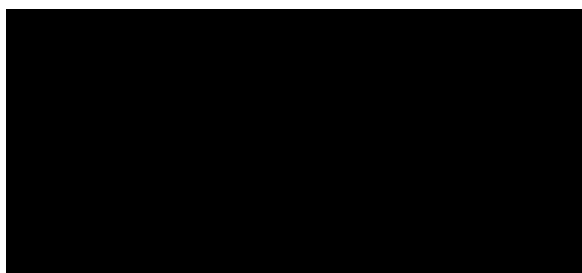
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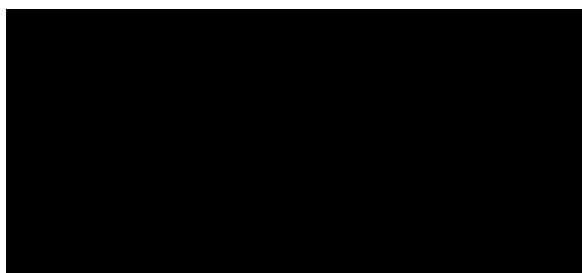
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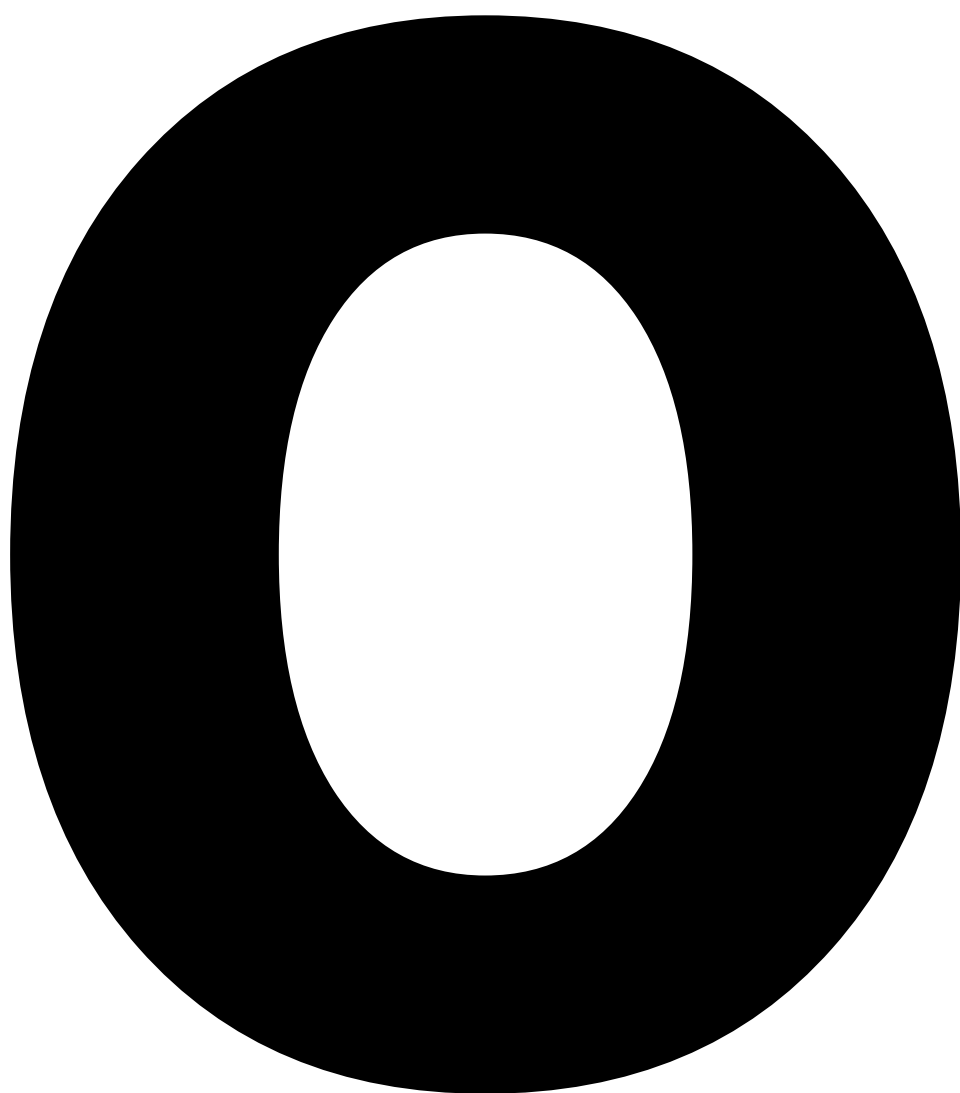
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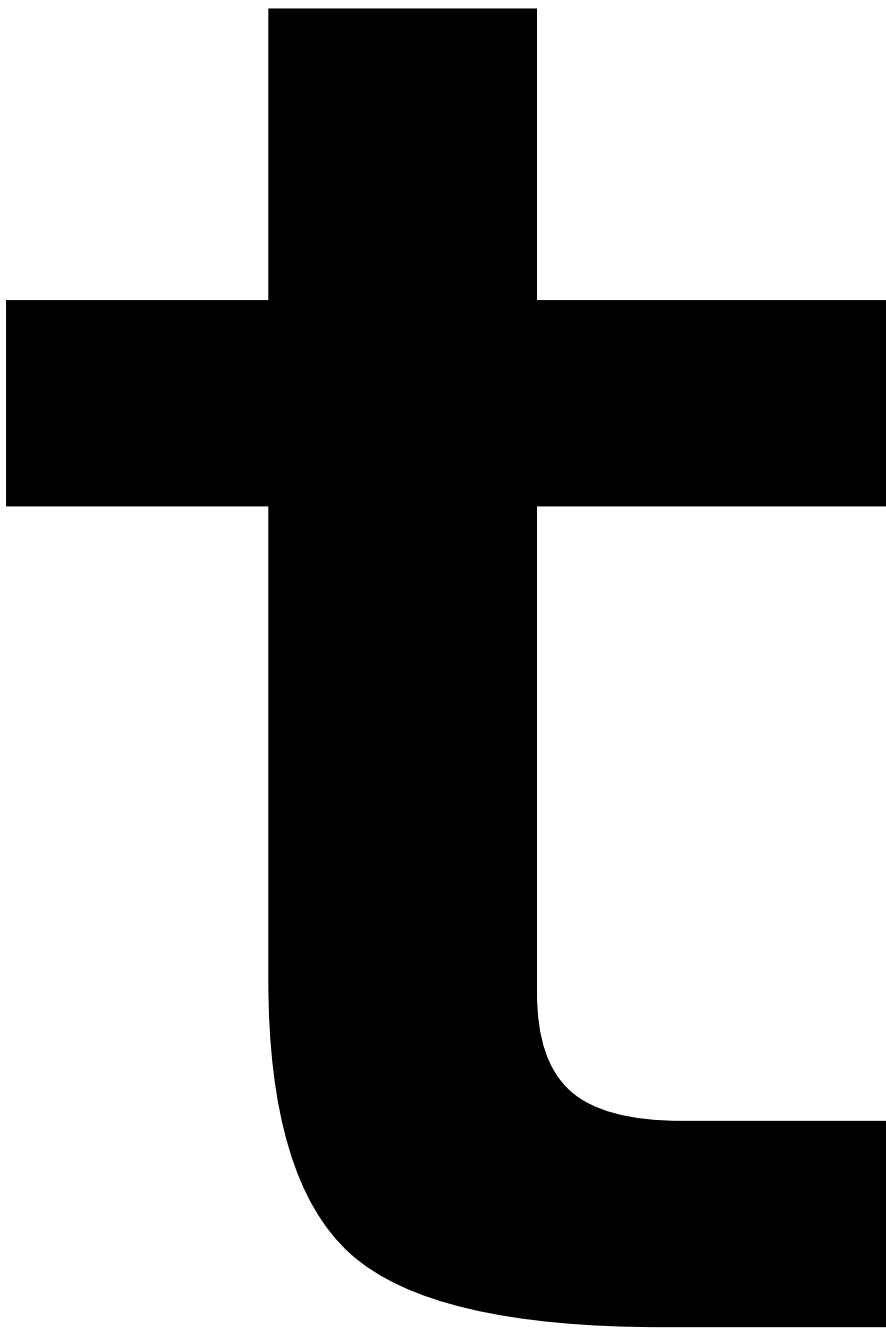
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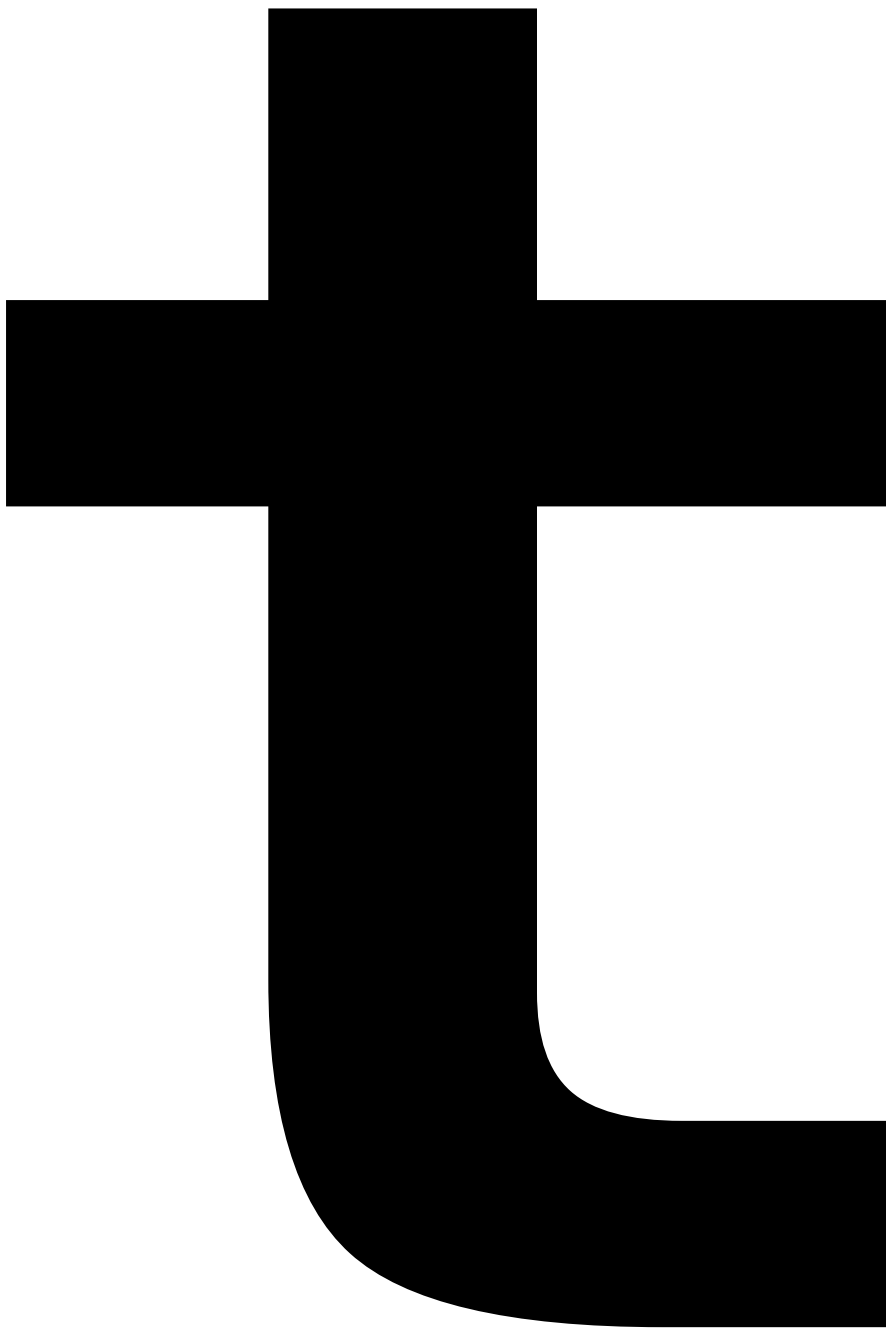
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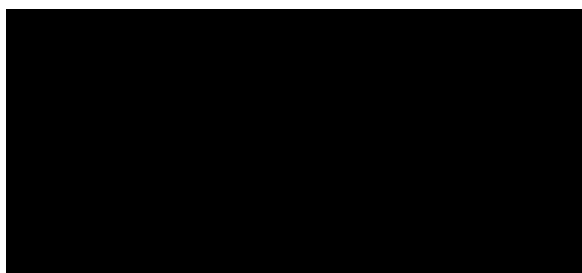
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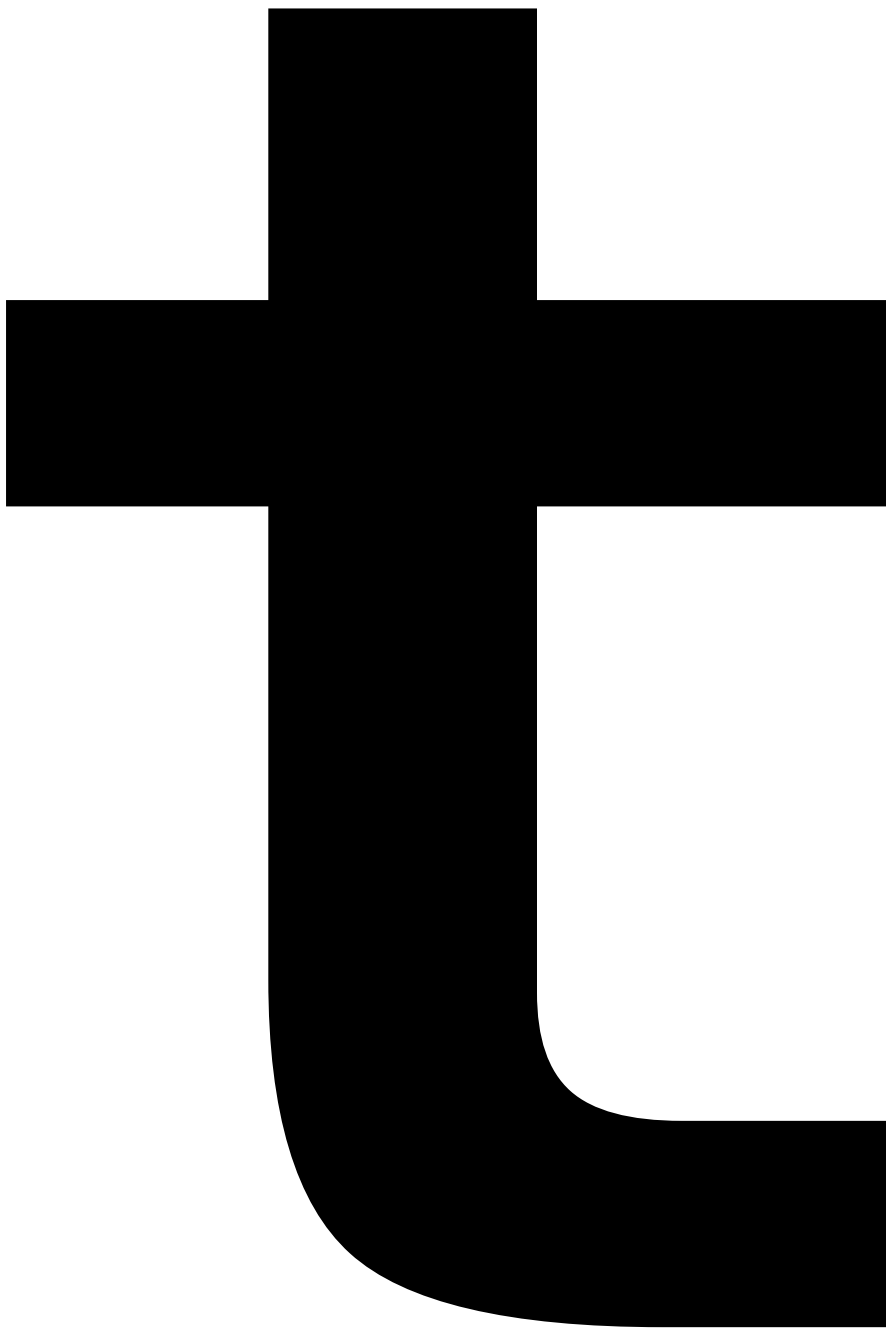
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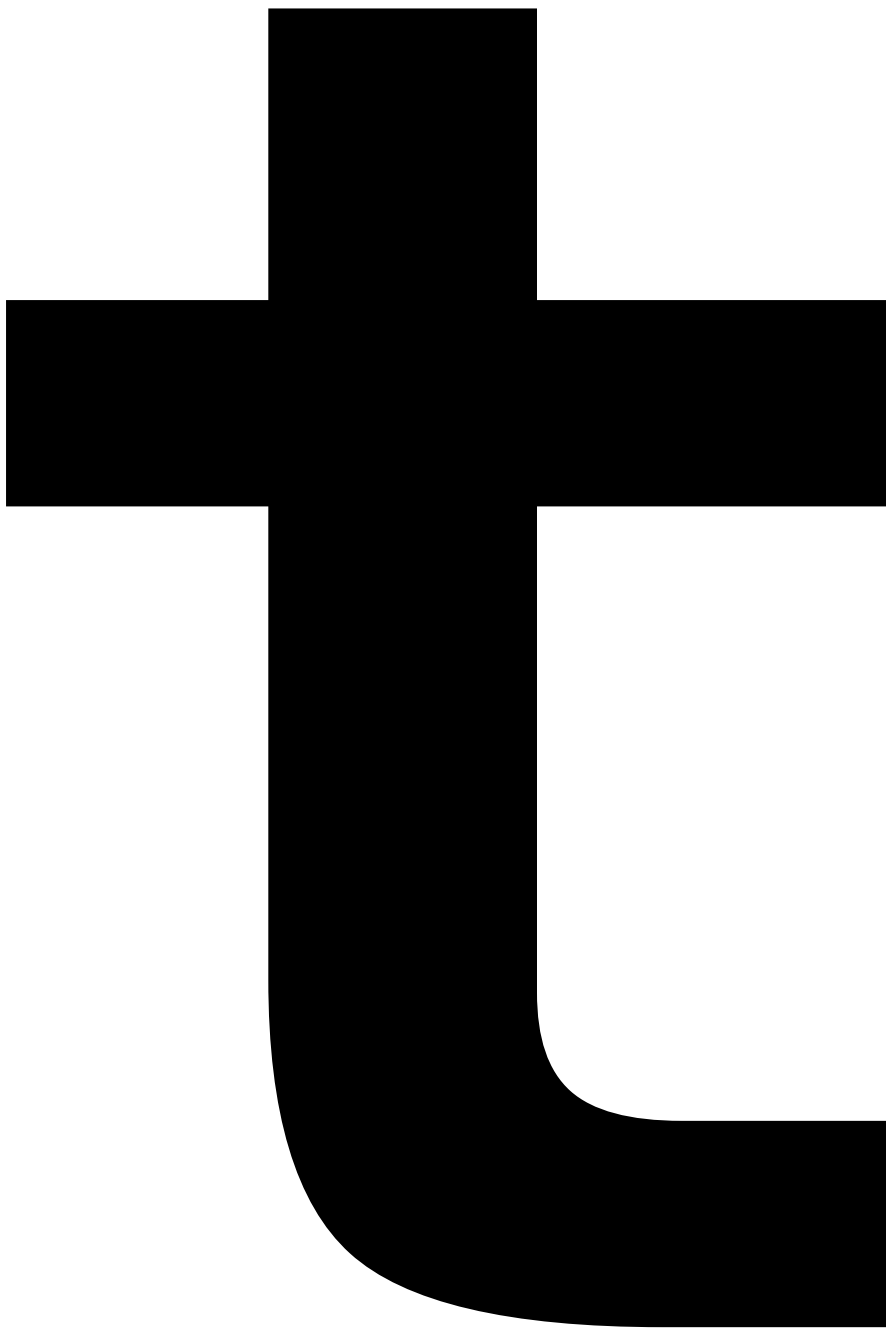
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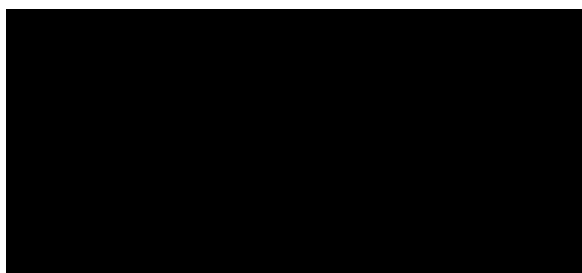




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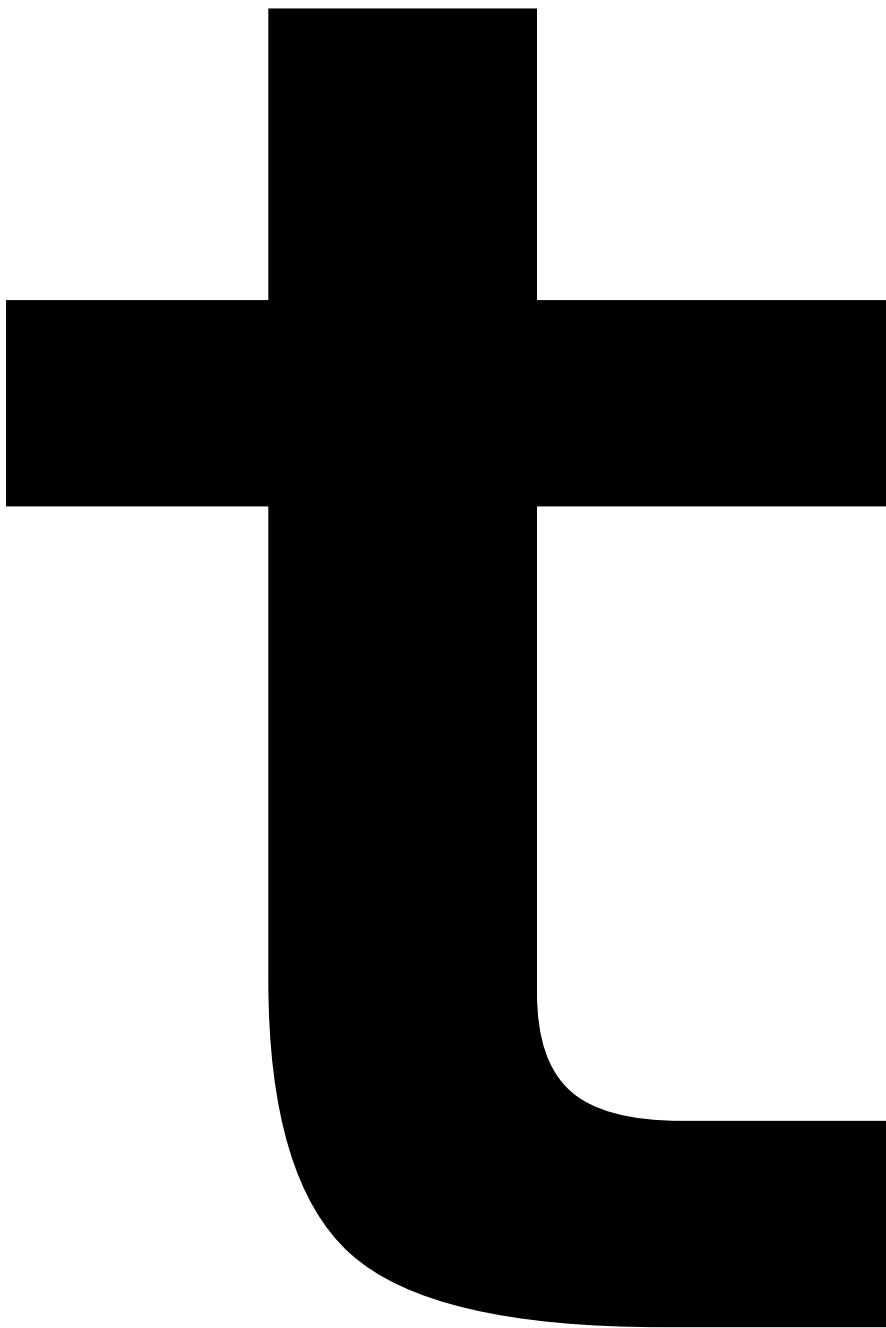
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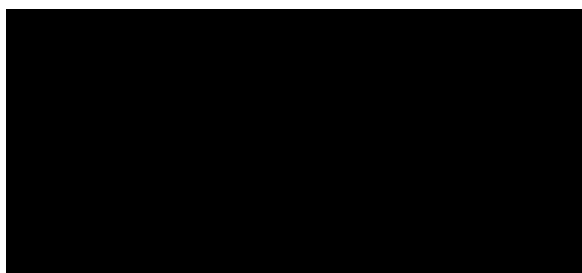


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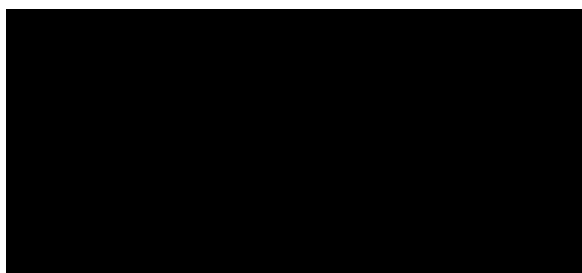
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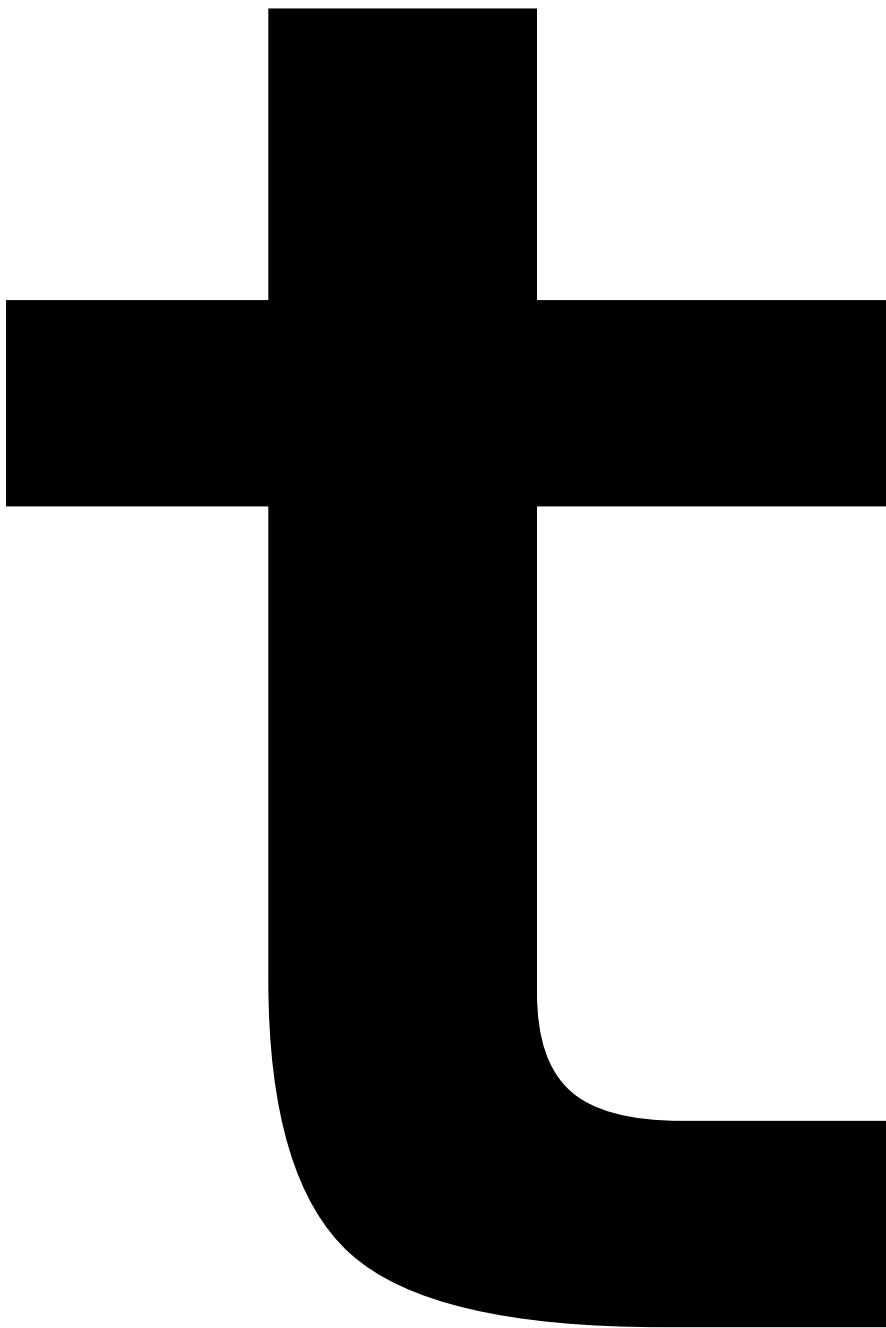


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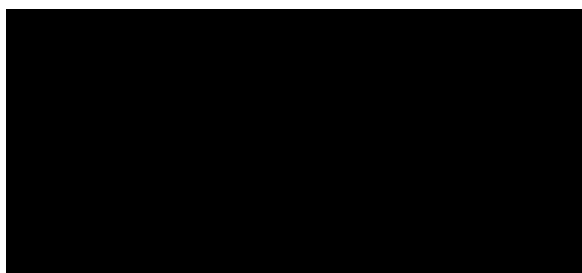
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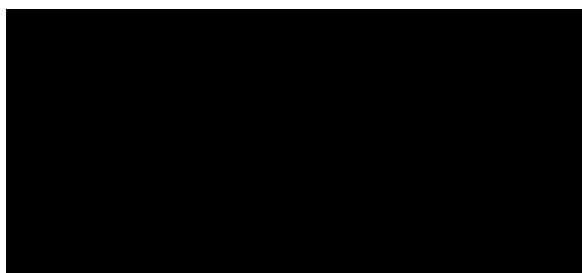
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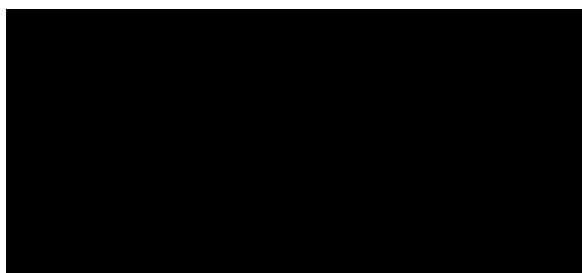




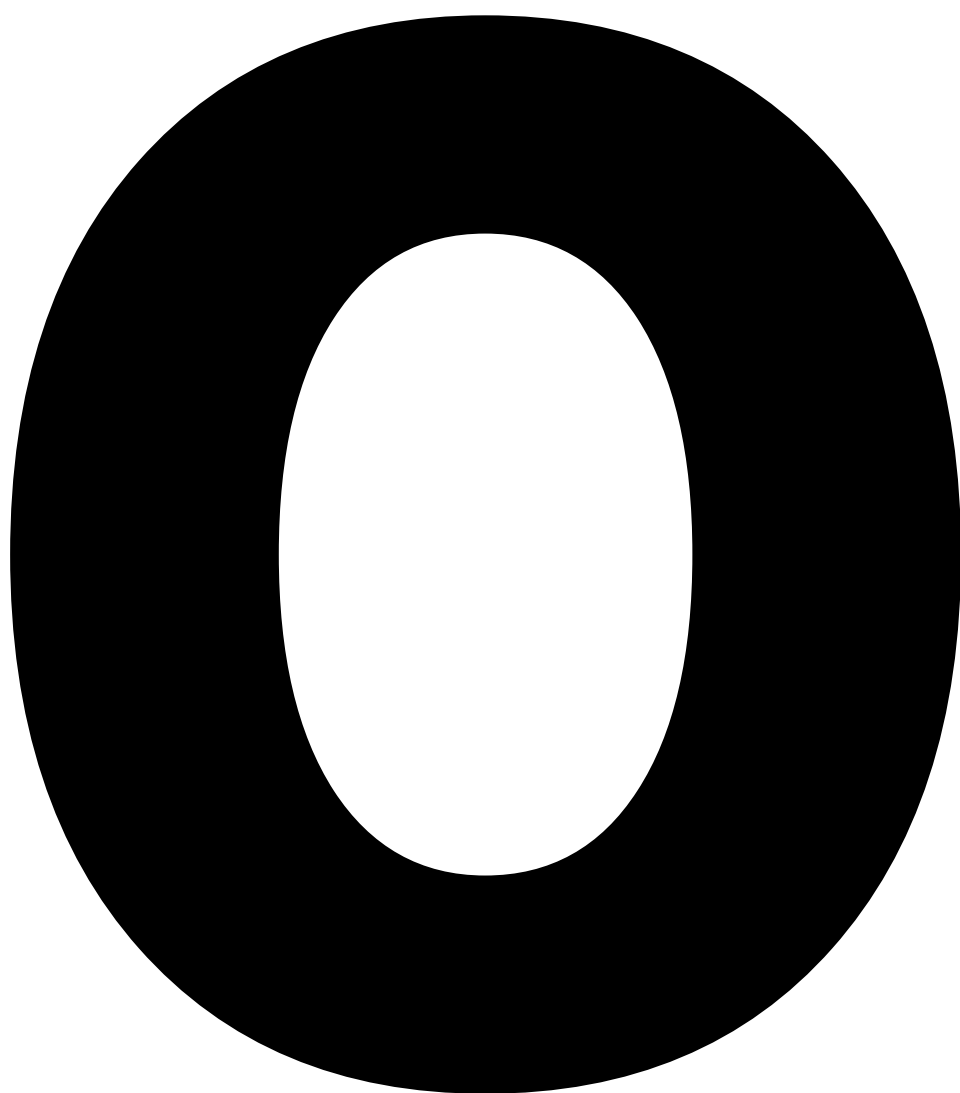
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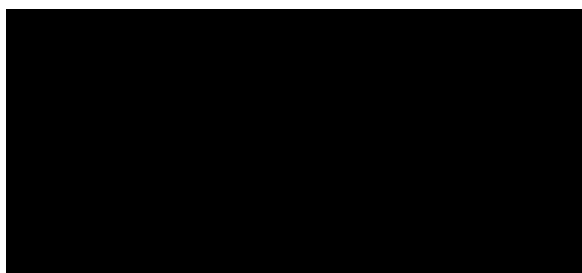


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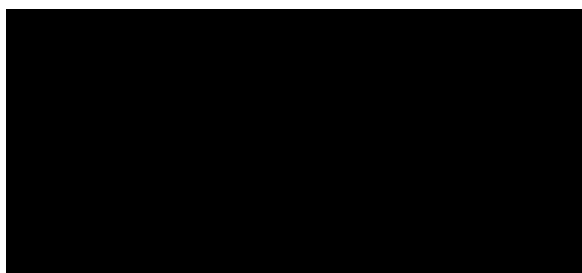


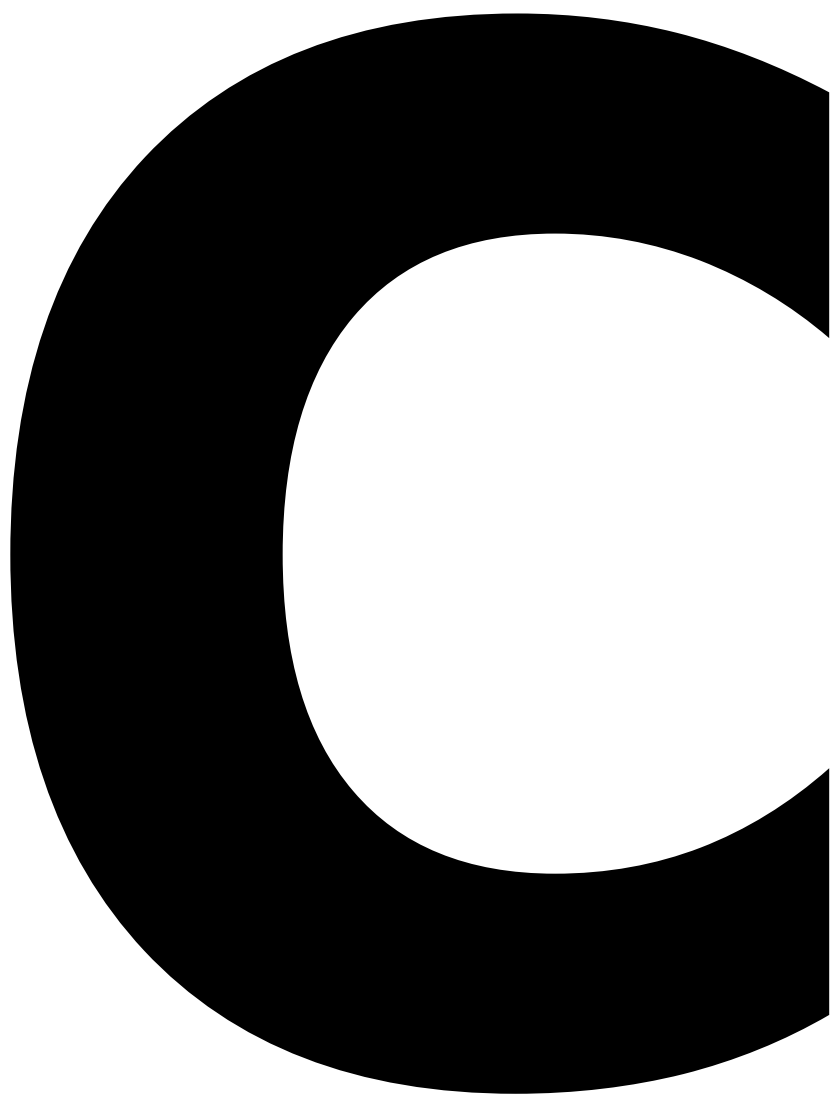


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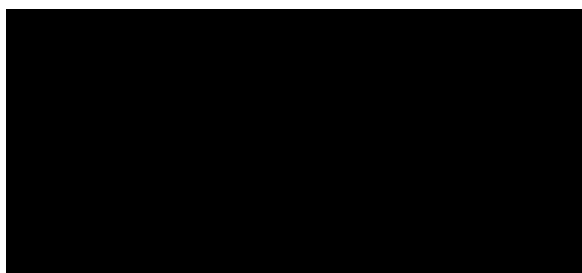
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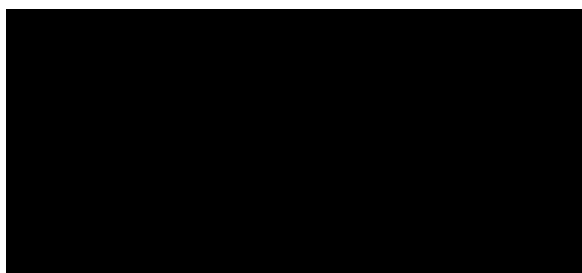
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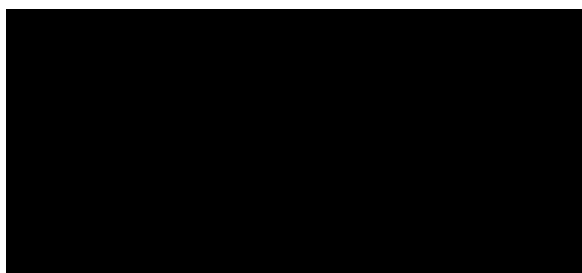
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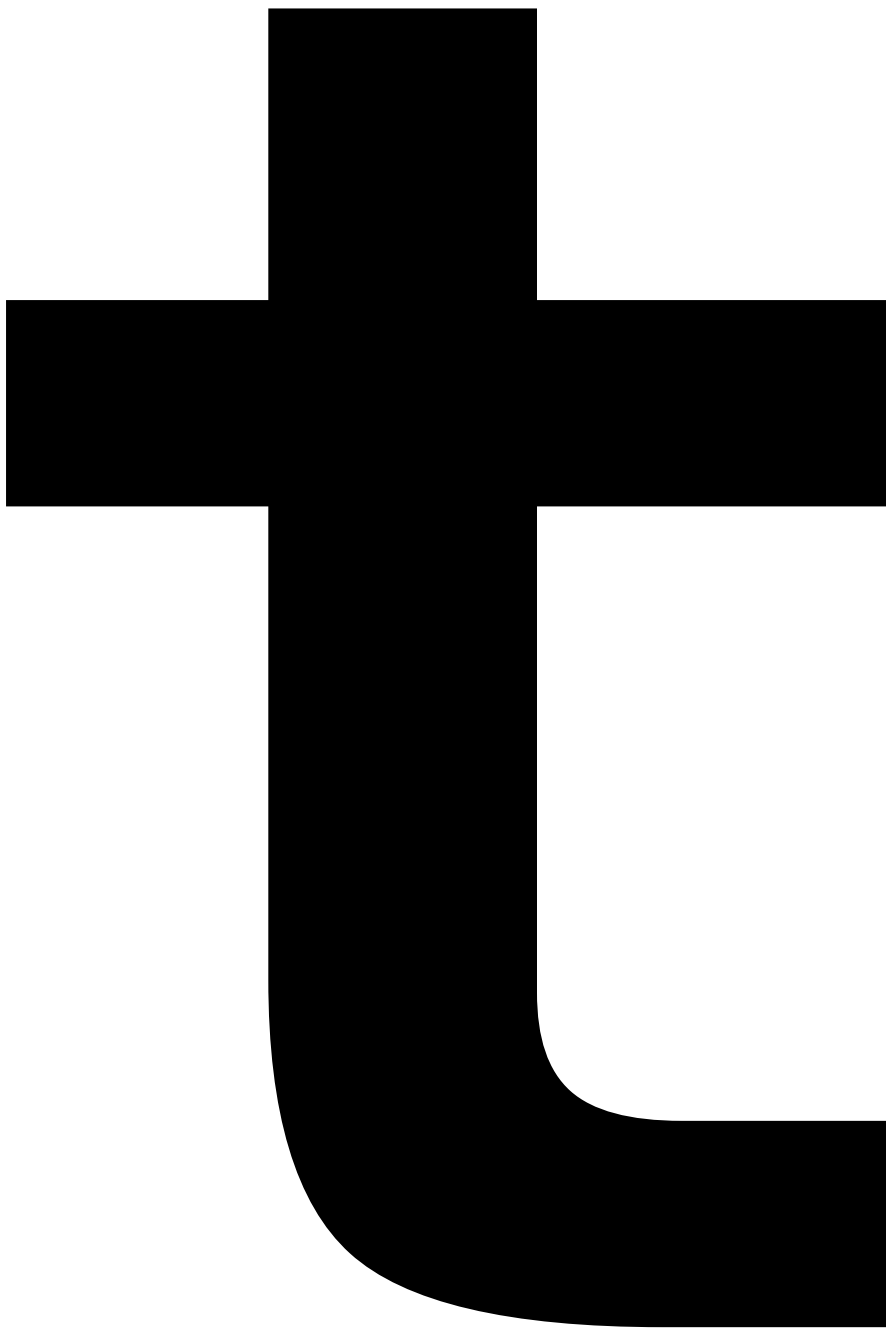
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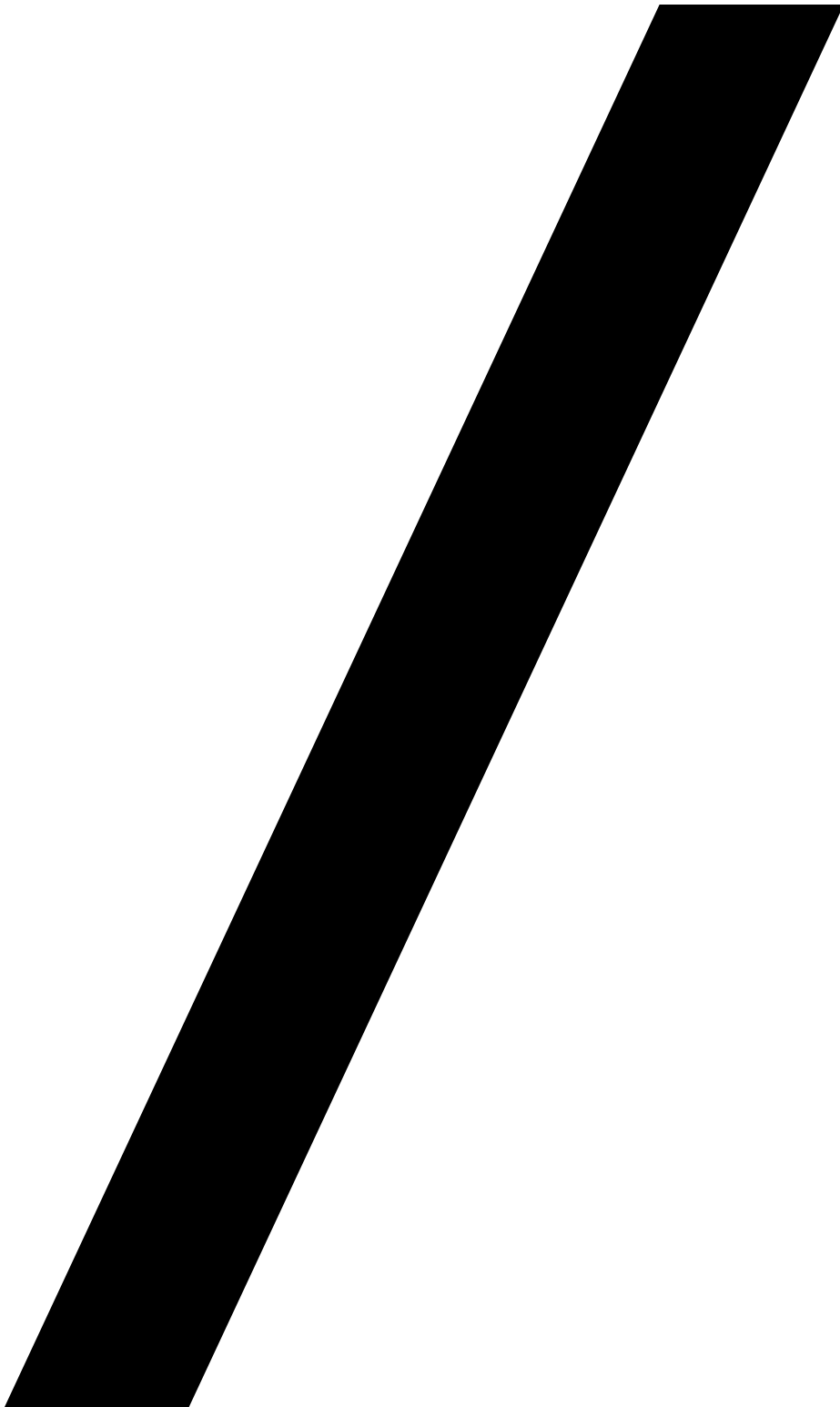


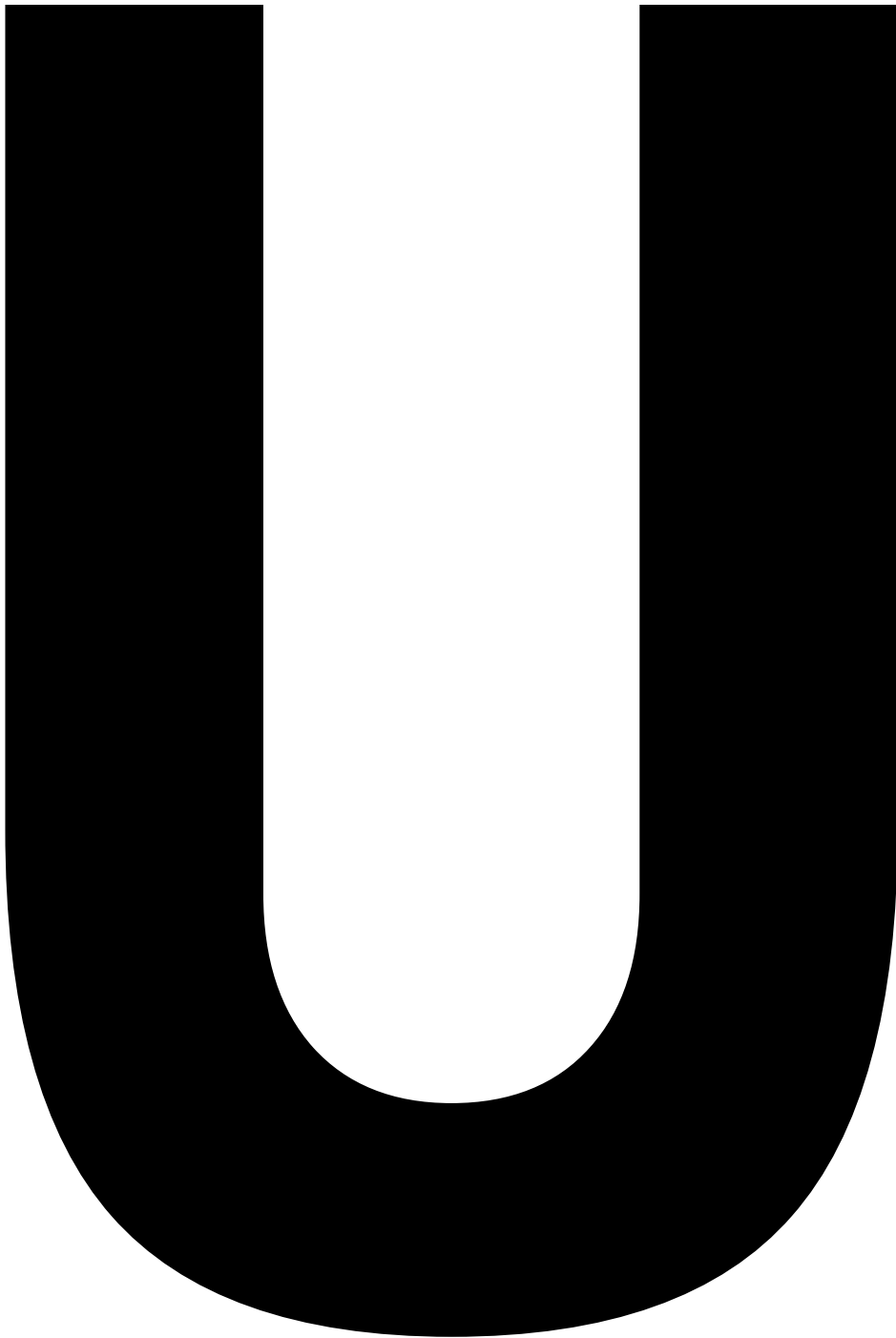
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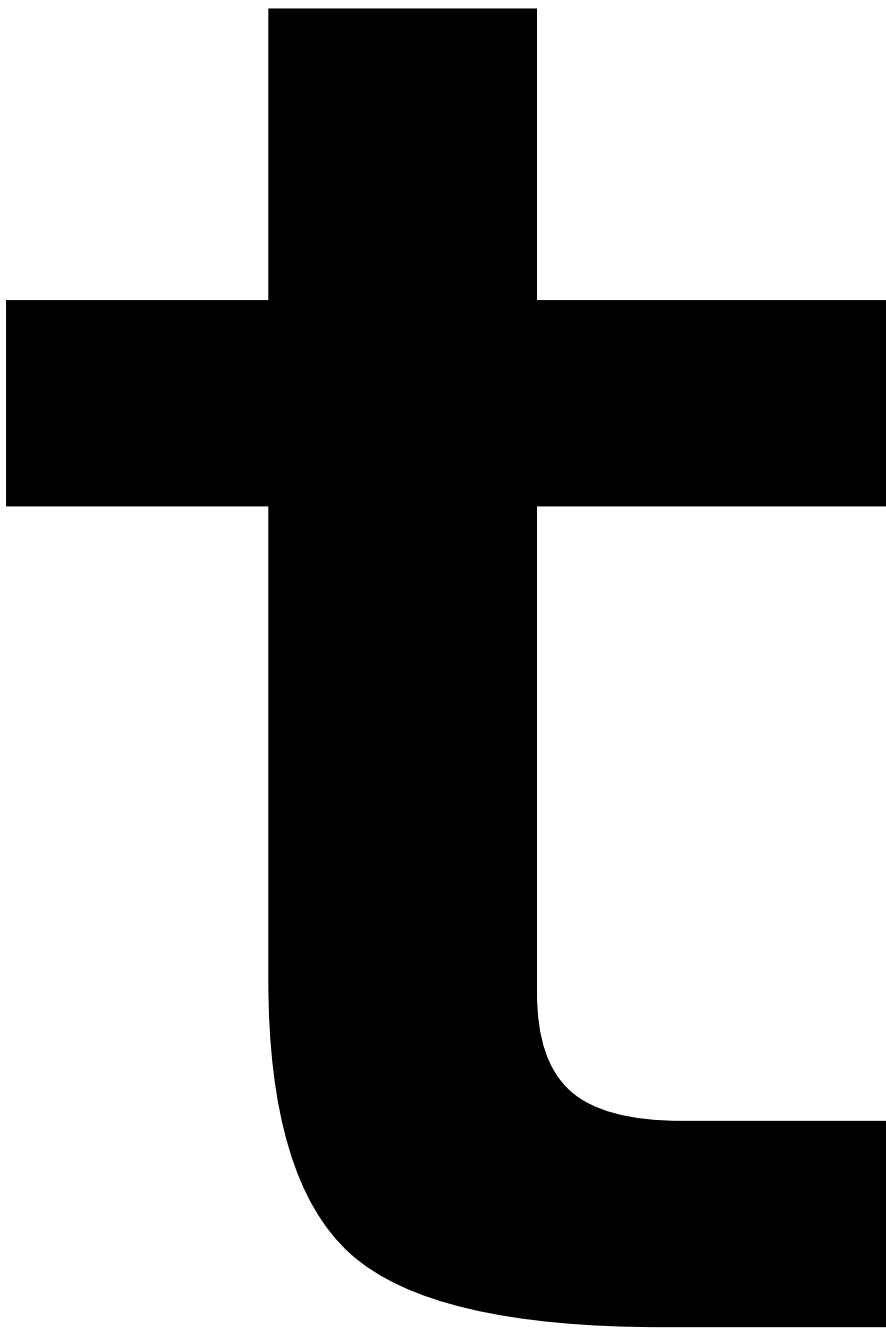
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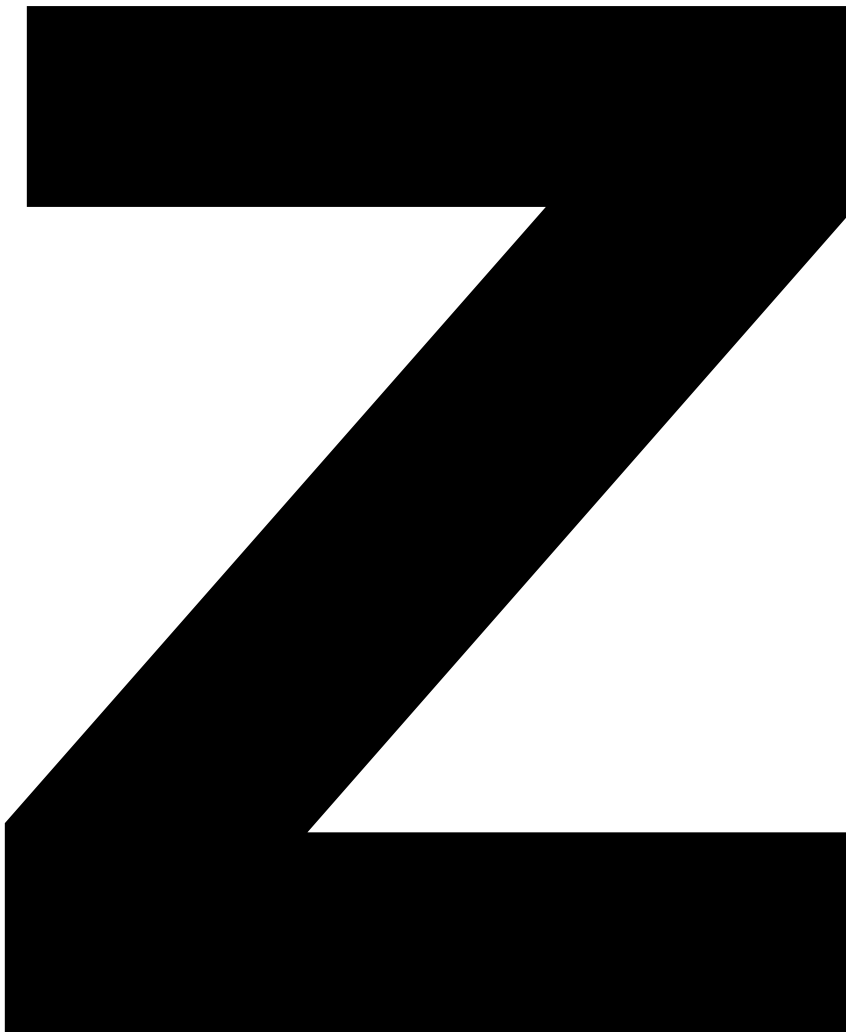
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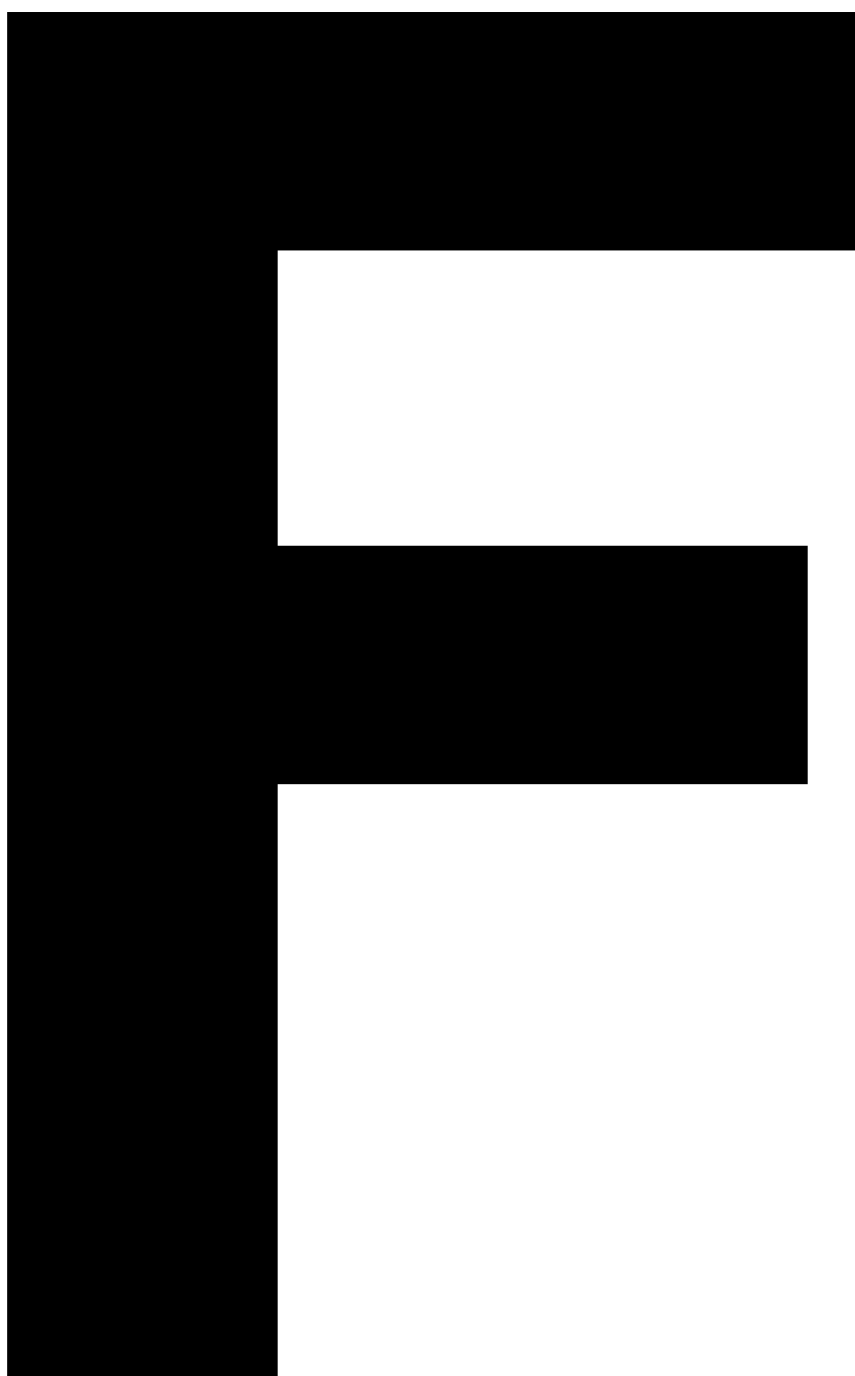
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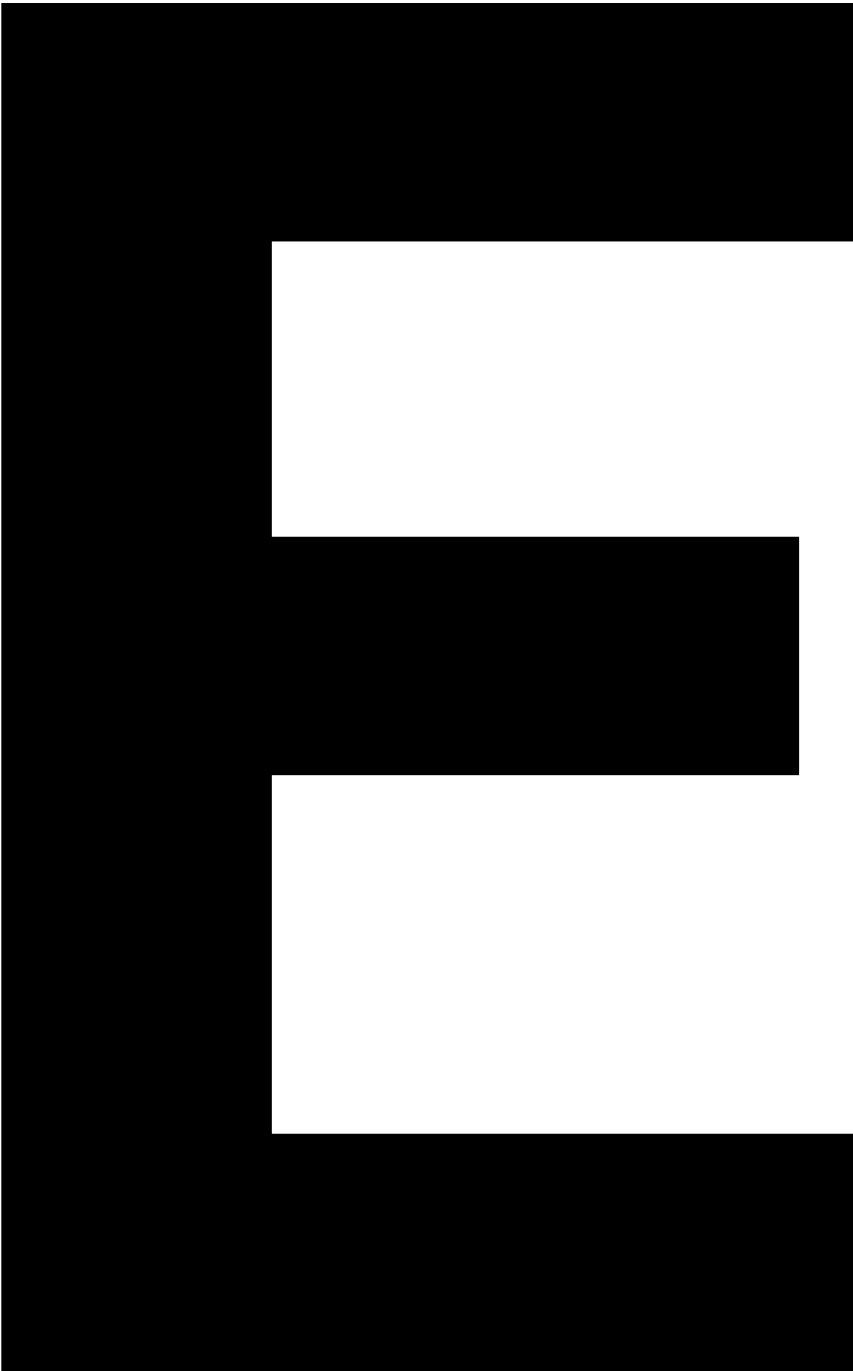
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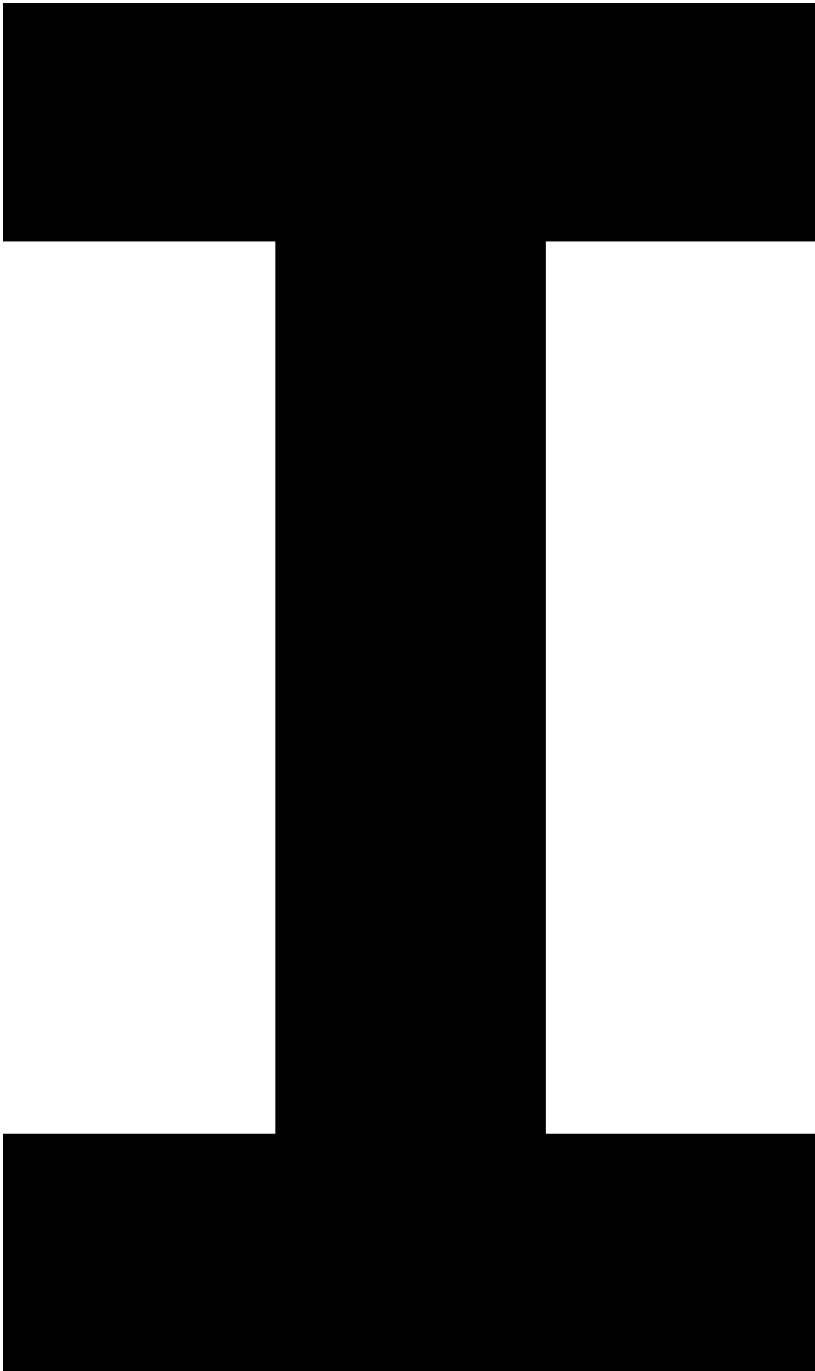


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