

# Netzentgelte: Auf Steigflug programmiert – Prognosefehler erhöhen die Kosten

geschrieben von Wolfgang Müller | 30. Januar 2015

Für solche Wettervorhersagen wird ein sehr großer wissenschaftlicher Aufwand getrieben. Im Bereich der Meteorologie gibt es zahlreiche Institute, in denen hochkarätige Wissenschaftler tätig sind. Diesen stehen Computersysteme der Spitzenklasse zur Verfügung, da enorme Datenmengen in kürzester Zeit verarbeitet werden müssen. Die entsprechenden Programme sind sehr aufwendig und werden ständig überarbeitet und verbessert. Dennoch gibt es immer wieder unerfreuliche Überraschungen, und Vorhersagen über Zeiträume von mehr als drei Tagen sind von eher begrenzter Brauchbarkeit. Selbst im 24-h-Bereich kommt es gar nicht so selten vor, dass die Wetterprognosen erheblich danebenliegen.

Bild rechts: Der Wind, das himmlische Kind – führt die Meteorologen immer mal wieder an der Nase herum

Von Bedeutung ist dies auch im Energiesektor, denn mit zunehmendem Anteil an Strom aus Wind- und Solaranlagen hat die Sicherheit, mit der ihre Produktion vorausberechnet werden kann, immer größere Bedeutung für die Planungen der Betreiber von Kraftwerken und Stromnetzen.

## Bedeutung von Wetterprognosen für die Netzgebühren

**Die Planbarkeit des Stromaufkommens aus „erneuerbaren“ Quellen ist deshalb von Bedeutung, da der Einsatz von Grund-, Mittel- und Spitzenlastkraftwerken im Voraus geplant werden muss. Großkraftwerke sind aufgrund ihrer Größe träge und können nicht abrupt ein- oder ausgeschaltet werden. Nur Pumpspeicherkraftwerke lassen sich**

**innerhalb von 1-2 Minuten hochfahren, reine Gaskraftwerken benötigen dafür es schon etwa 15 Minuten. Bei Kohlekraftwerken kann dies je nachdem, ob sie schon mit vorgewärmtem Kessel im „Hot Standby“ bereitstehen oder gar aus der Kaltreserve hochgefahren werden müssen, einige Stunden bis einige Tage dauern. Vor diesem Hintergrund können sich Irrtümer der Wettervorhersage als sehr teuer erweisen.**

**Grundlage der Einsatzplanung der Netzbetreiber sind die Prognosen über den zu erwartenden Verlauf des Tagesbedarfs. Diesen Bedarf kann man heute mit zufriedenstellender Sicherheit prognostizieren und die Einsatzpläne der konventionellen Kraftwerke darauf abstimmen. Anders sieht es dagegen mit der schwankenden Erzeugung aus Windenergie- und Solaranlagen aus.**

**Probleme bereiten vor allem kurzfristige Schwankungen im Bereich von 0–48 Stunden, weil in diesem Zeitbereich Abweichungen oft durch Regelenergie ausgeglichen werden müssen.**

**Diese Regelenergie muss separat beschafft werden und stellt daher einen zusätzlichen Kostenfaktor dar. Zudem kann es bei größeren Prognoseabweichungen zu Spannungsschwankungen kommen, durch die in Extremfällen sogar die Netzsicherheit in Gefahr geraten könnte [SOWI]. Laut der gleichen Quelle hat deshalb die Bundesnetzagentur die Verteilnetzbetreiber bereits im Januar 2011 aufgefordert, die Prognosemethoden ihrer Solarstromeinspeisung zu verbessern.**

**Prognosequalität  
bei Wind:  
Anspruch...**

**Schaut man sich  
das  
Prospektmaterial  
von Prognosefirmen  
an, die  
Vorhersagen für  
die  
Leistungsabgabe**

**von Windparks  
feilbieten, so  
stehen dort  
Aussagen wie: „Für  
beliebige  
Standorte und  
Regionen in  
Deutschland,  
Europa und  
weltweit“ (liefern  
wir) „eine  
zuverlässige**

**Windleistungsprognose der zu erwartenden Windleistung – und zwar bis zu 10 Tage im Voraus und mit einer zeitlichen Auflösung von bis zu 15 Minuten [WIPR]. Weiter heisst es dort:**

**„Die  
Windleistungsvorher-  
sage beruht auf  
der optimalen  
Kombination  
verschiedener  
Wettermodelle, der  
Einbindung der  
lokalen  
Gegebenheiten in  
der Umgebung der  
Windparks sowie**

**der numerischen  
Wettervorhersage.  
Auf der Grundlage  
ausgewählter  
Windparks wird die  
gesamte  
Windstromspeisu  
ng einer Region  
ermittelt. Hierbei  
werden die  
repräsentativen  
Standorte so**

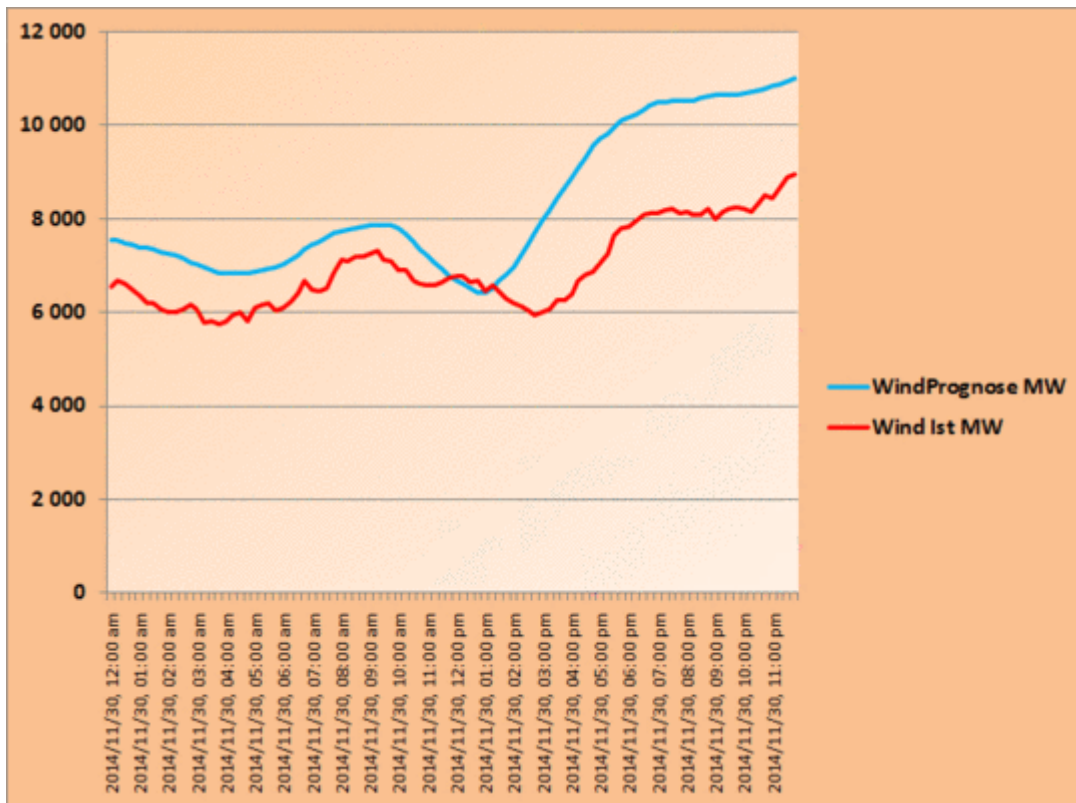


**gewählt, dass sie  
die regionale  
Verteilung der  
Windenergieanlagen  
sehr genau  
widerspiegeln. Die  
Genauigkeit der  
Vorhersage  
variiert mit der  
Wettersituation“.  
Letzterer Satz  
lässt natürlich**

**etwas aufhorchen.  
Doch kann man bei  
Wikipedia dazu  
beruhigende  
Aussagen wie  
folgende finden:  
„Die Genauigkeit  
der Vorhersage für  
ganz Deutschland  
beträgt für den  
Zeitraum einer  
Vorhersage ca. 95**

**Prozent (normierte Standardabweichung ca. 5 %). Ein hoher Wert ist wichtig, weil somit Regelenergie und damit Kosten eingespart werden können [WIKI]. Klingt im Prinzip ganz ordentlich. Doch wie sieht das**

# in der Realität aus?



**Bild 1. Prognose  
für das Aufkommen  
an Windstrom am  
30. November 2014  
im Vergleich zur**

**tatsächlichen**

**Produktion (Daten:  
EEX)**

**...und**

**Wirklichkeit**

**eit**

**Dazu**

**werfen**

**wir einen**

**Blick auf**

**die  
Prognosen  
für das  
Aufkommen  
an Wind-  
und**

**Solareins**

**peisung**

**am 30.11.**

**2014**

**sowie auf**

**die**



**entsprech  
enden**

**Ist -**

**Zahlen .**

**Diese**

**Werte**

**waren**

**bisher**

**leicht**

**überprüfb**

**ar, da**

**sie von**

**der  
Strombörs  
e EEX  
bereitges  
teilt  
wurden**

**und dort**

**über**

**Jahre**

**hinweg im**

**Archiv**

**abgerufen**

**werden**

**konnten (1**

**) [EEX].**

**Die für**

**den**

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**enden Tag  
geltenden  
Prognosen  
wurden  
jeweils  
zum**

**Tageswech  
sel**

**bereitges**

**tellt und**

**spiegelte**

**n den**

**jeweils  
aktuellst  
en Stand  
der heute  
verfügbar  
en**



**Prognosef  
ähigkeite  
n wider.**

**Vor allem  
die Werte  
für den**

**Vormittag**

**sind**

**daher**

**Kurzzeitp**

**rognosen**

**über 6**

**bzw. 12**

**Stunden,**

**so dass**

**die**

**erzielte**

**Genauigke**

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**sse auf**

**die**

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**equalität**

**gerade**

**auch in**

**diesem**

**Kurzzeitb**

**ereich**

**zulässt.**

**Für das  
Windstrom  
aufkommen  
des  
30.11.201  
4 zeigt**

**Bild 1**

**den**

**Tagesverl**

**auf für**

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**Prognose**

**im**

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**n. Die  
entsprech  
enden  
Absolut-  
und  
Prozentua**

**Werte**

**der**

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**gen zeigt**

**Bild 2.**

**Man**

**erkennt,  
dass der  
Fehler  
bereits  
bis zur  
Mittagsze**

**it bei**

**bis zu**

**1.250 MW**

**bzw. 17 %**

**liegt.**

**Das**

**entspricht  
nahezu  
der  
Leistung  
von zwei  
Kohlekraft**

**twerken .**

**Nach**

**einem**

**kurzen**

**Einbruch**

**um die**

**Mittagszeit  
herum  
ging es  
mit der  
Prognose-  
abweichung**

**dann**

**jedoch**

**nochmal**

**so**

**richtig**

**nach**



**oben, mit  
einem**

**Maximum**

**von knapp**

**2.700 MW**

**bzw. 28 %**

**etwa**

**gegen**

**15 . 00**

**Uhr .**

**Anders**

**ausgedrüc**

**kt:**

**Allein**

**für die**

**Fehlprogn**

**ose beim**

**Wind**

**mussten**

**demnach**

**konventio**

**nelle**

**Kraftwerk**

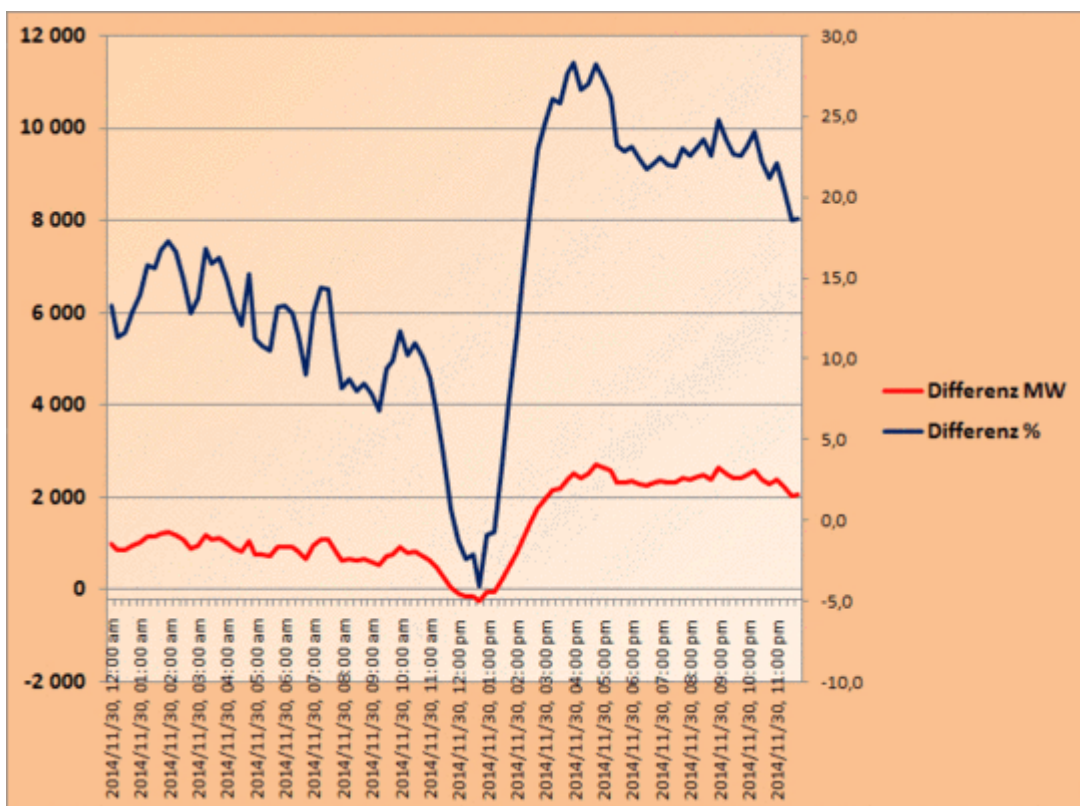
**e mit der**

**Leistung  
von vier  
Kohlekraft  
werken  
nahezu im  
Alarmstar**

t

hochgejag

t werden.



**Bild 2.**

**Tagesverl**

**auf der**

**absoluten**

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**g in**

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**MW**

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**Leistung**

**(rot,**



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**sowie die**

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g (rechte  
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November**

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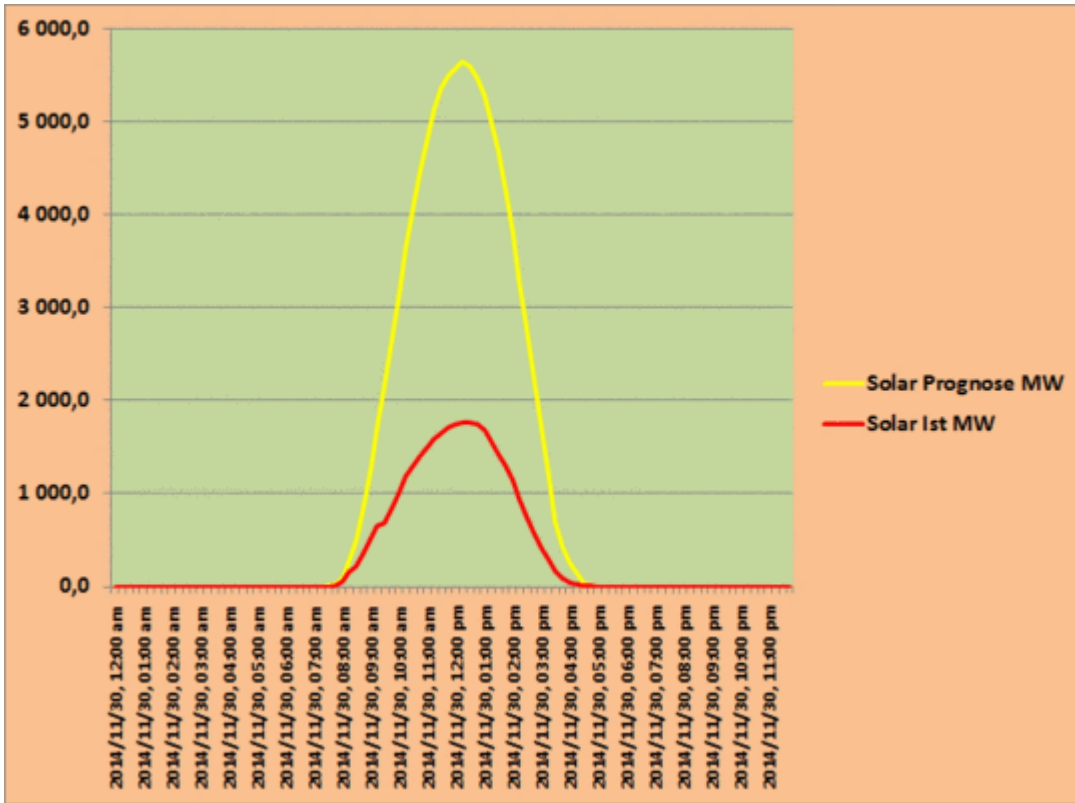
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**81%**

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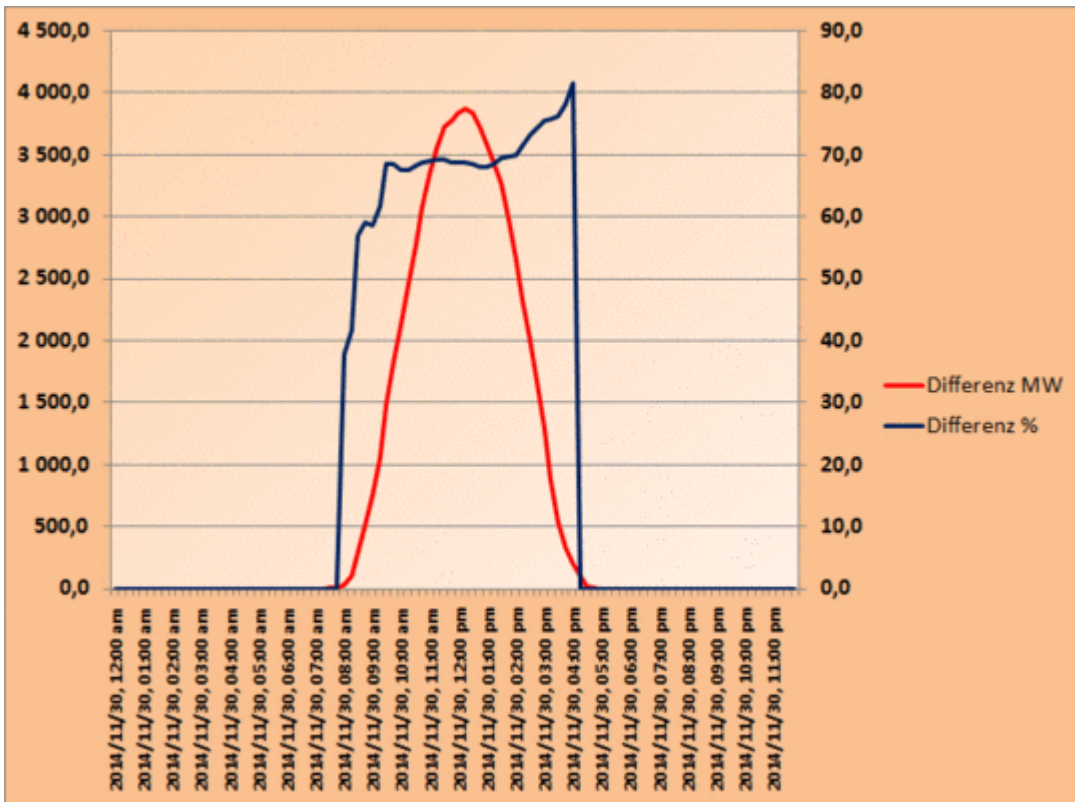
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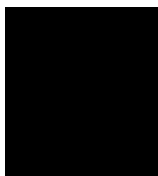
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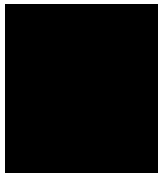
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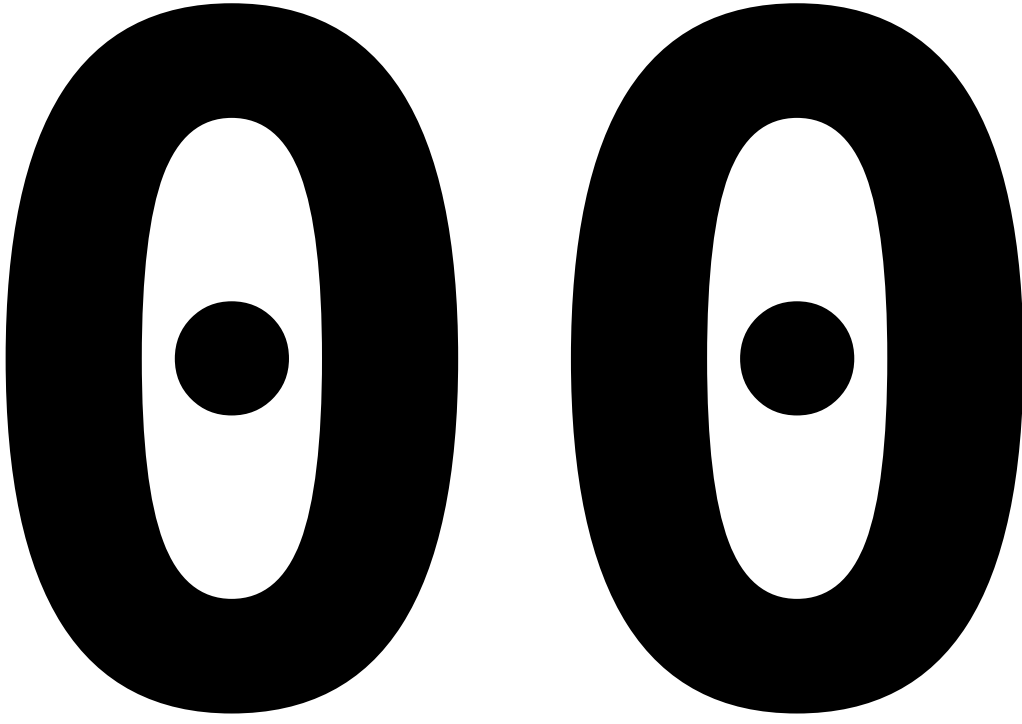
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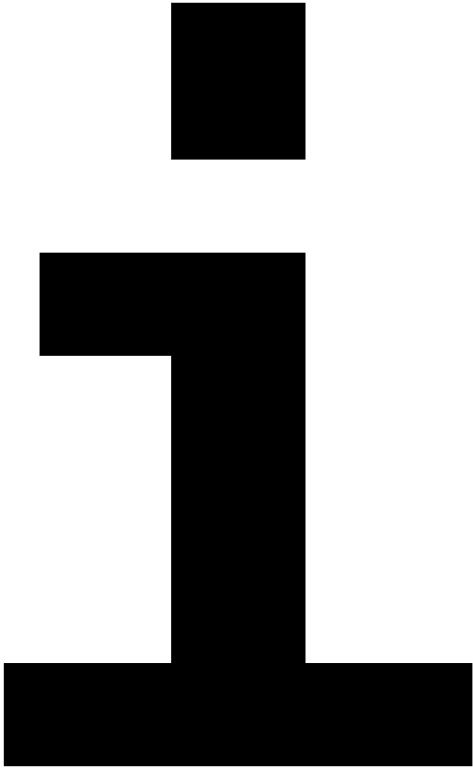
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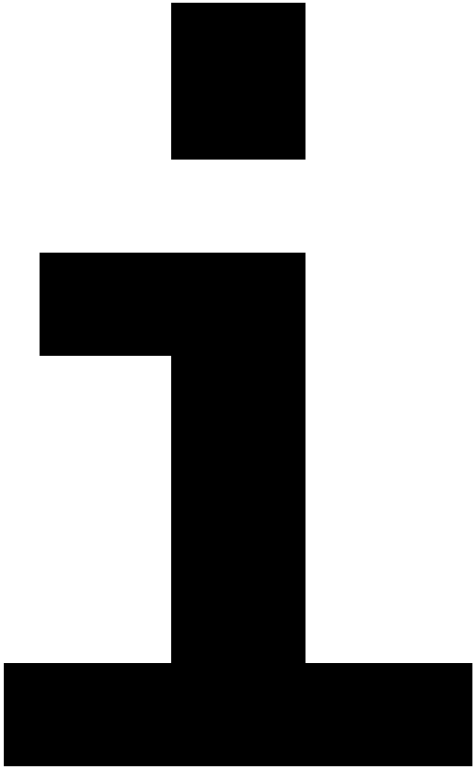


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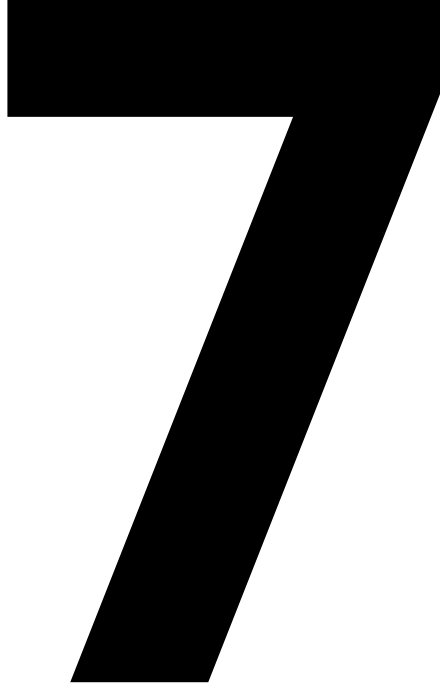
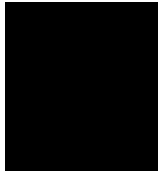
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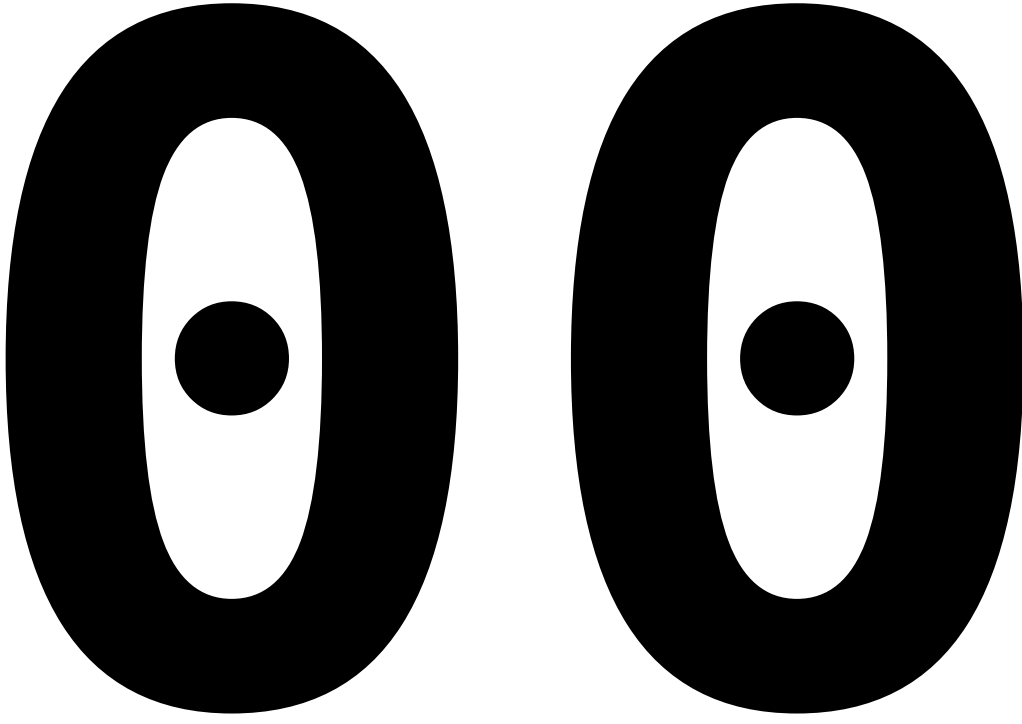
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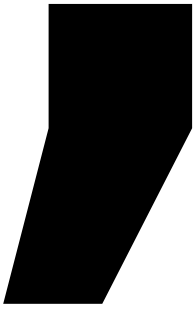


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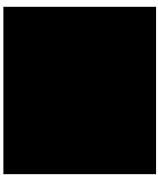
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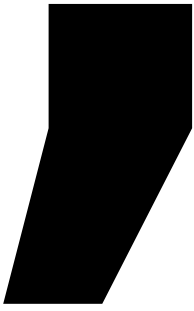
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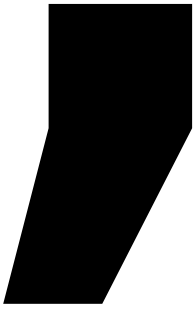
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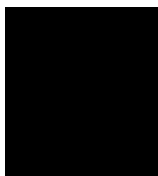
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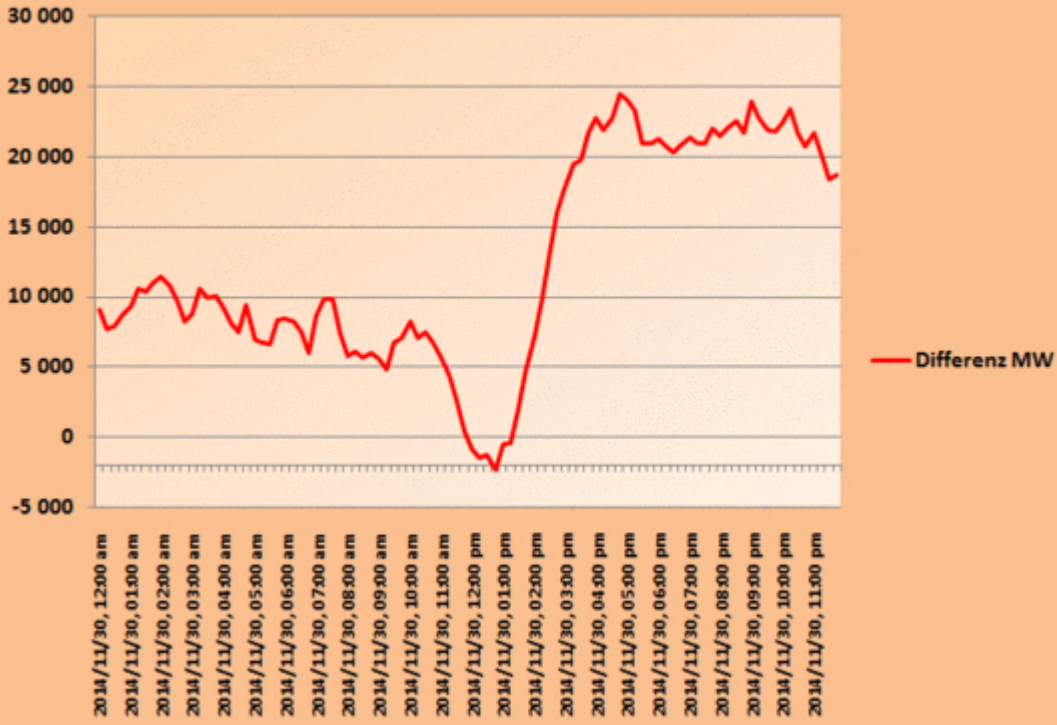
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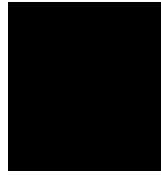


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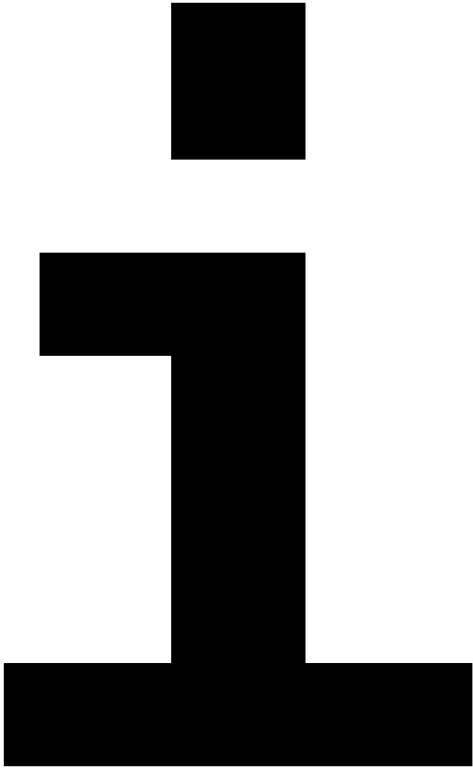
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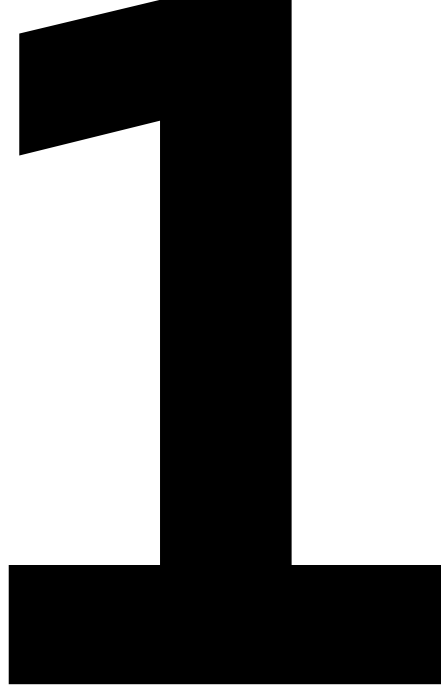
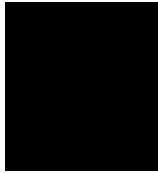
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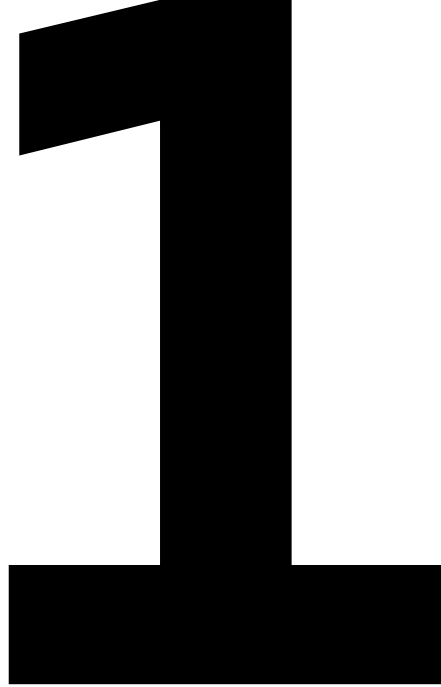
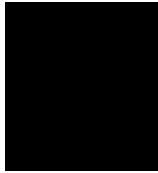
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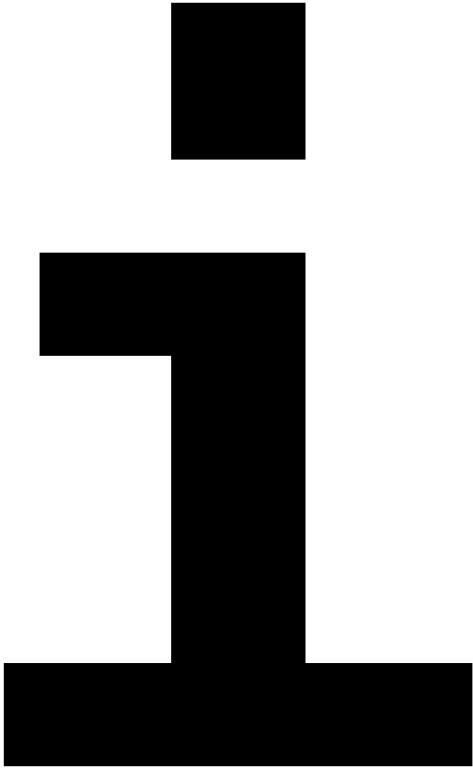
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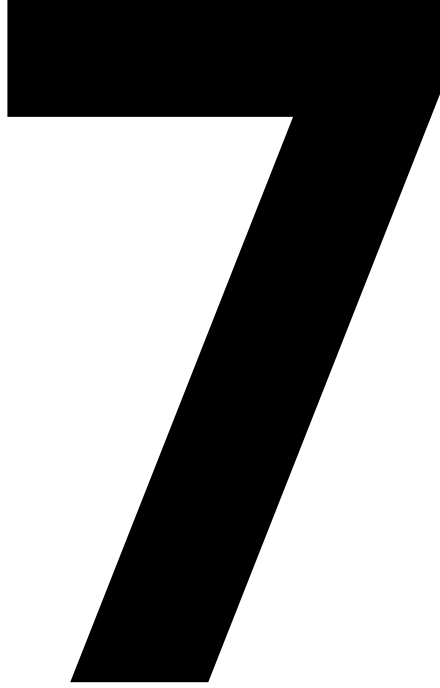
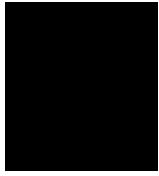
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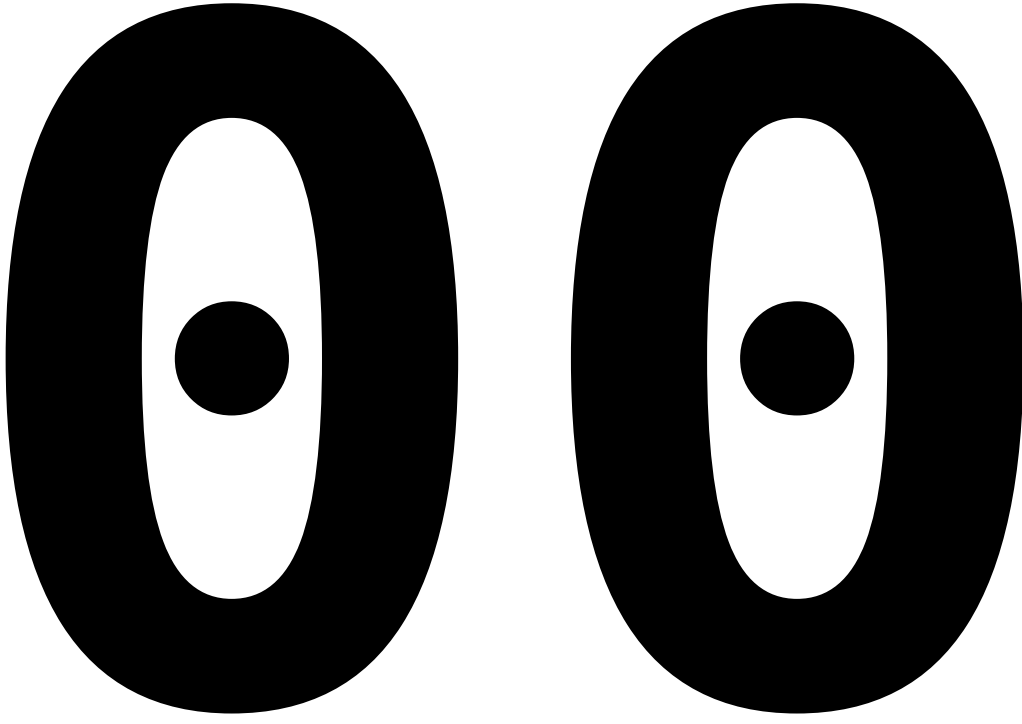
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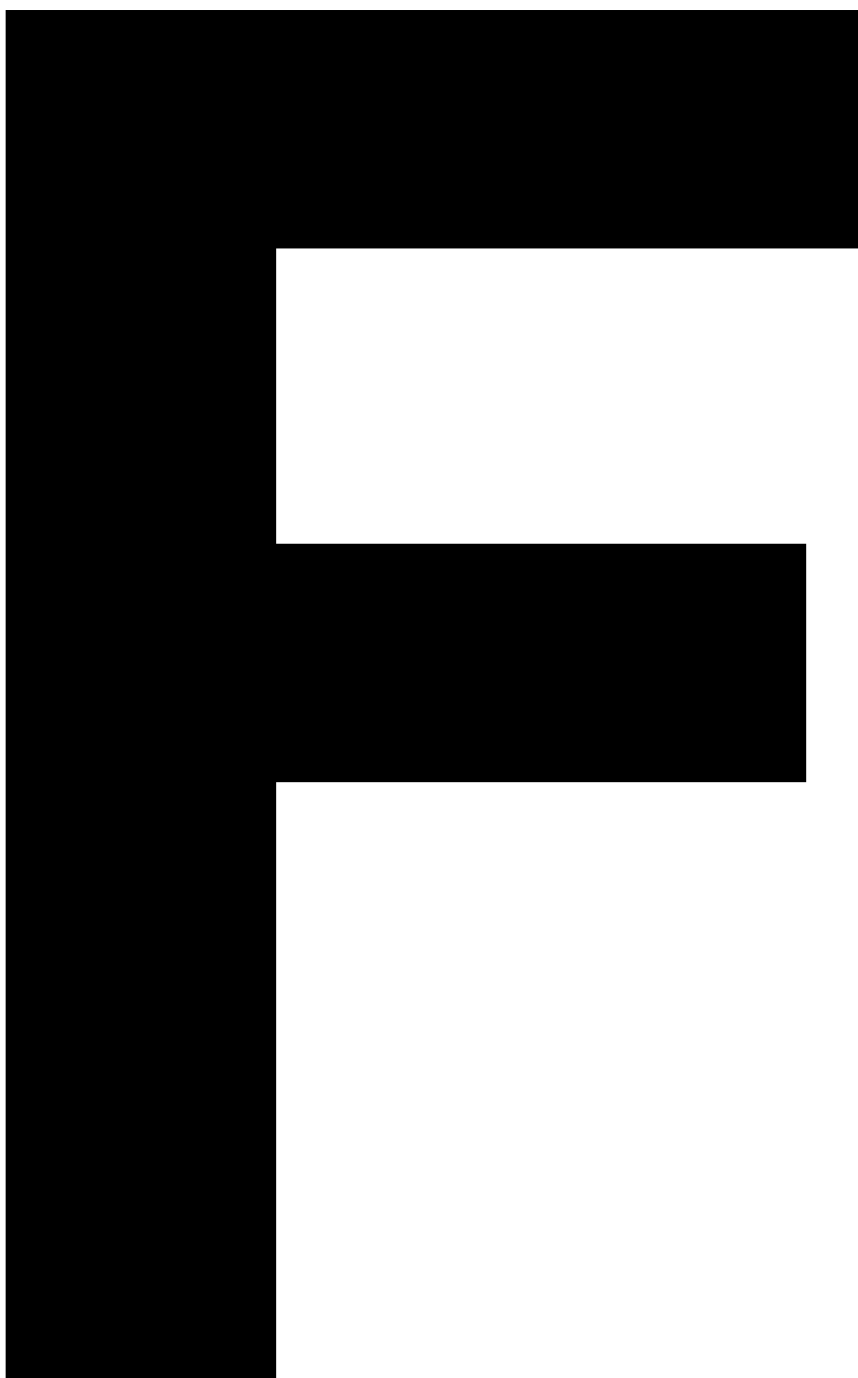


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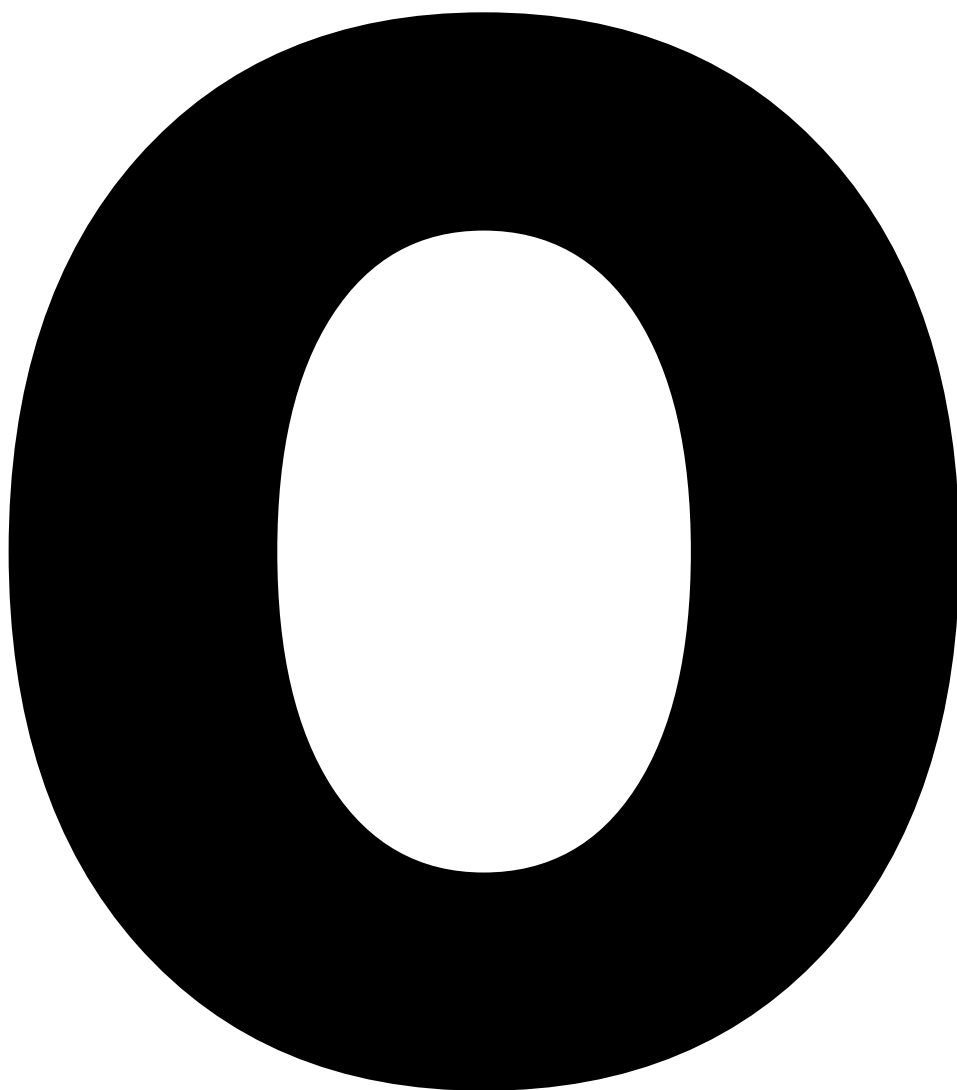
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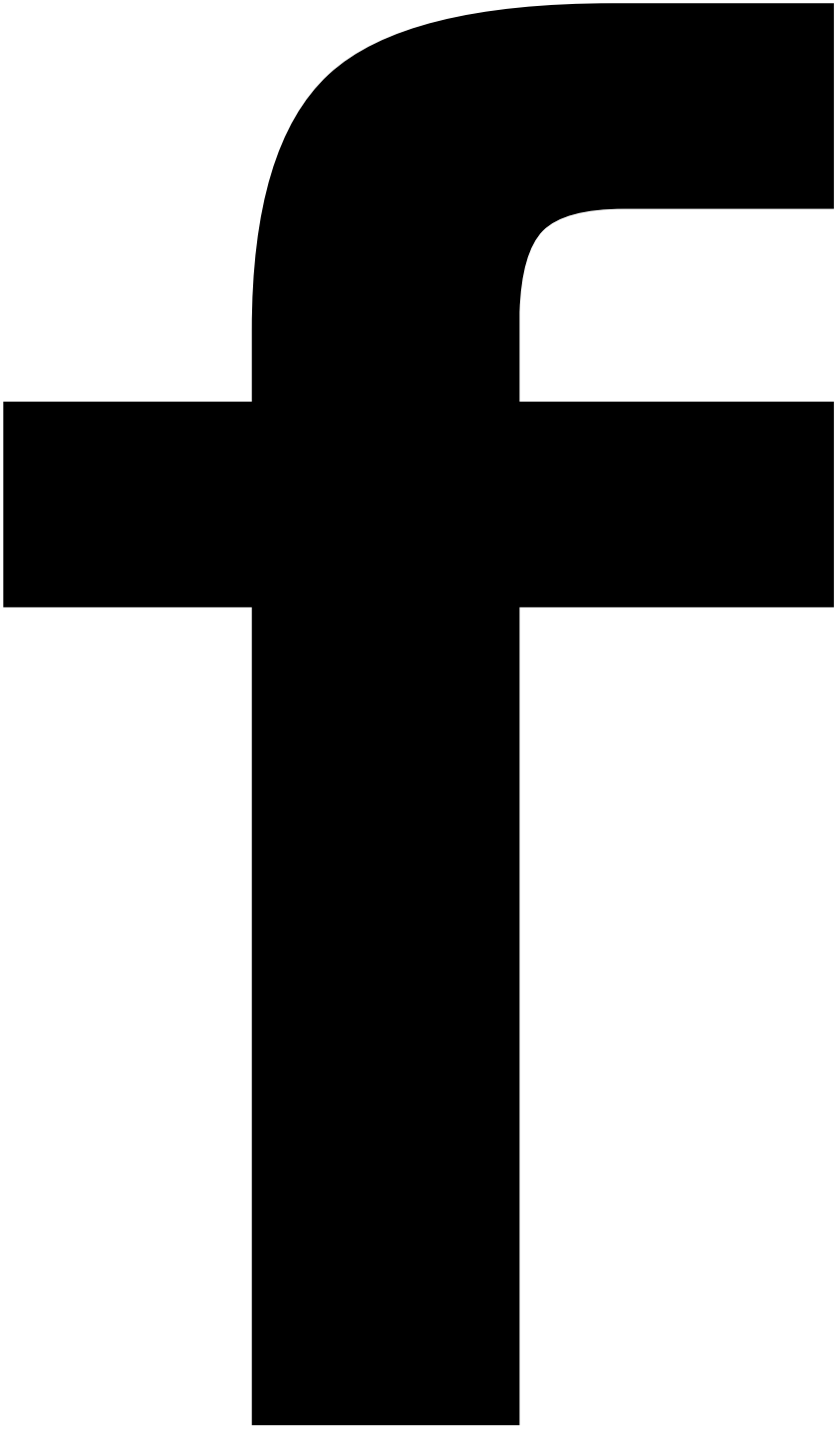
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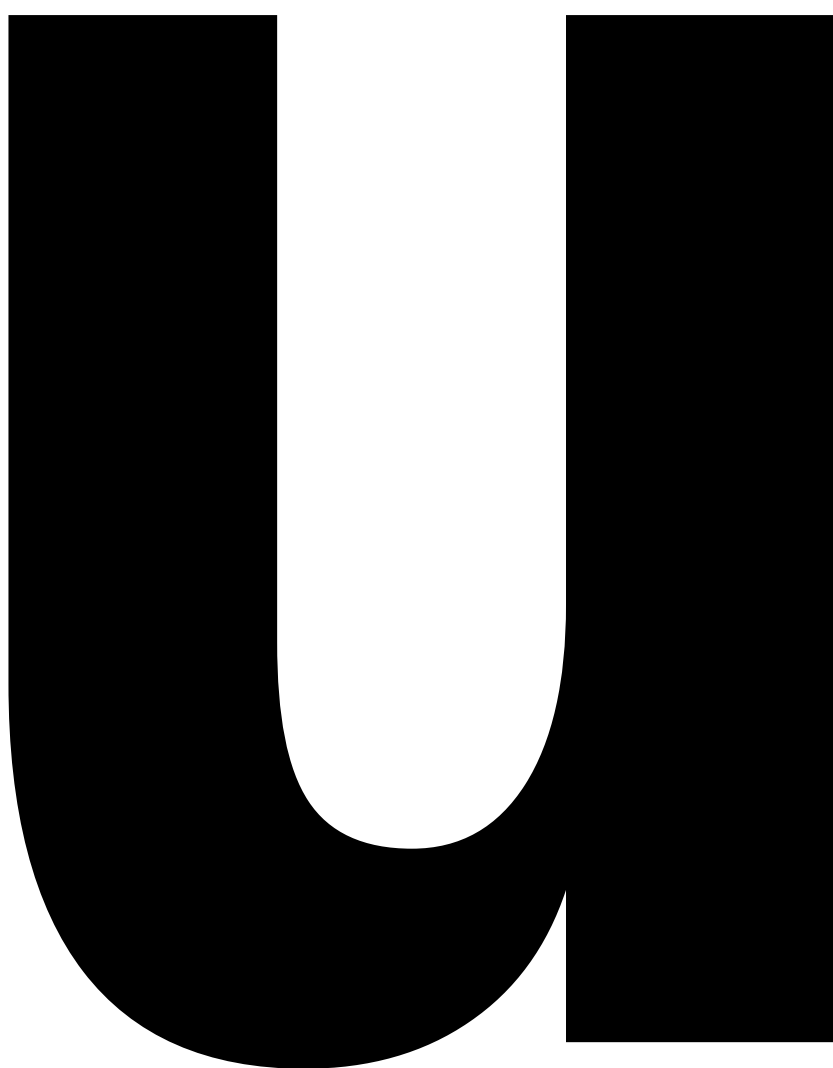


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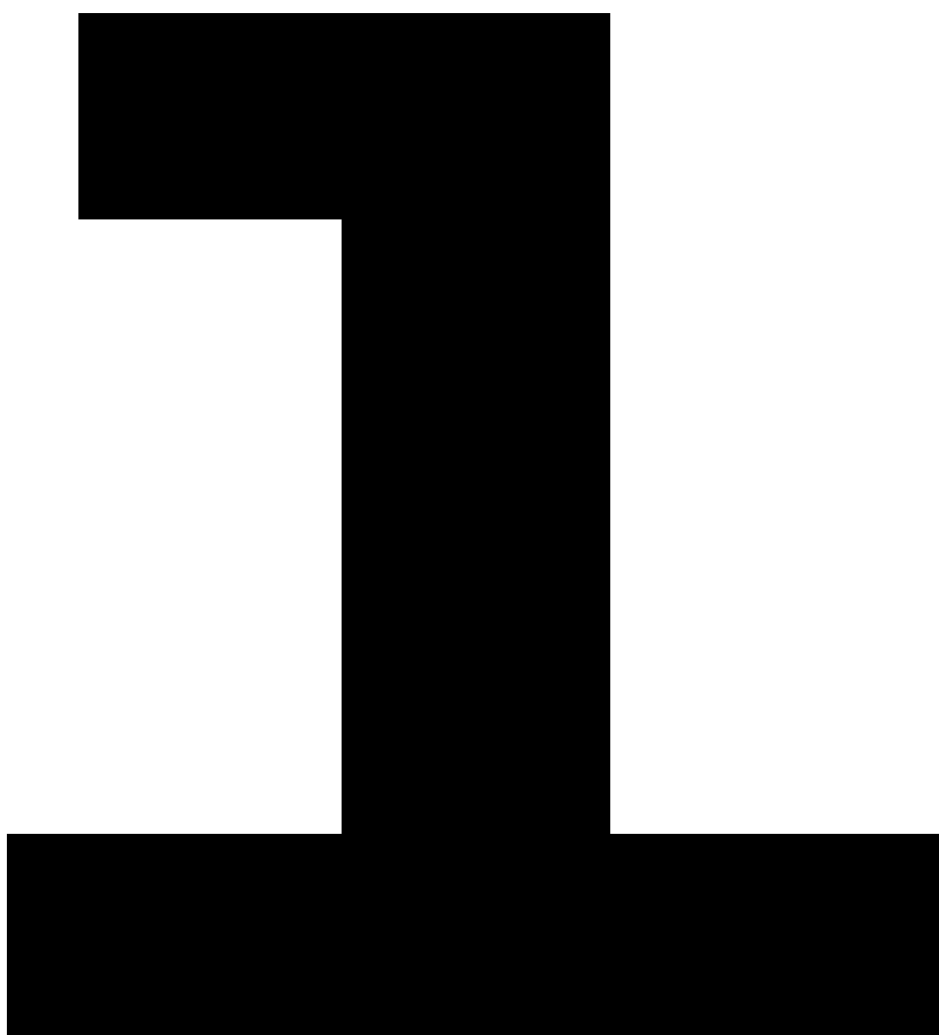
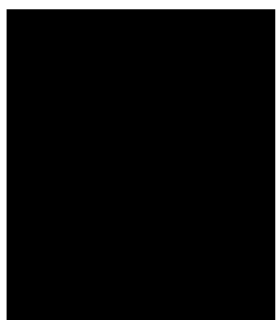
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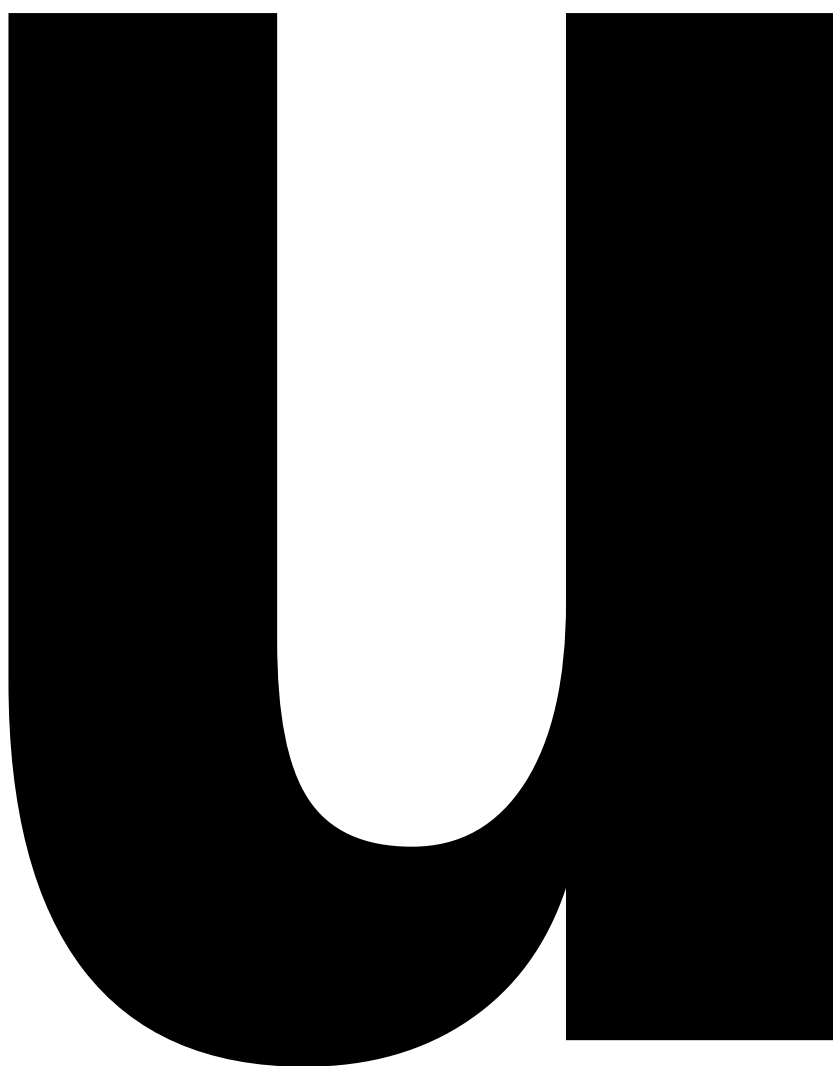
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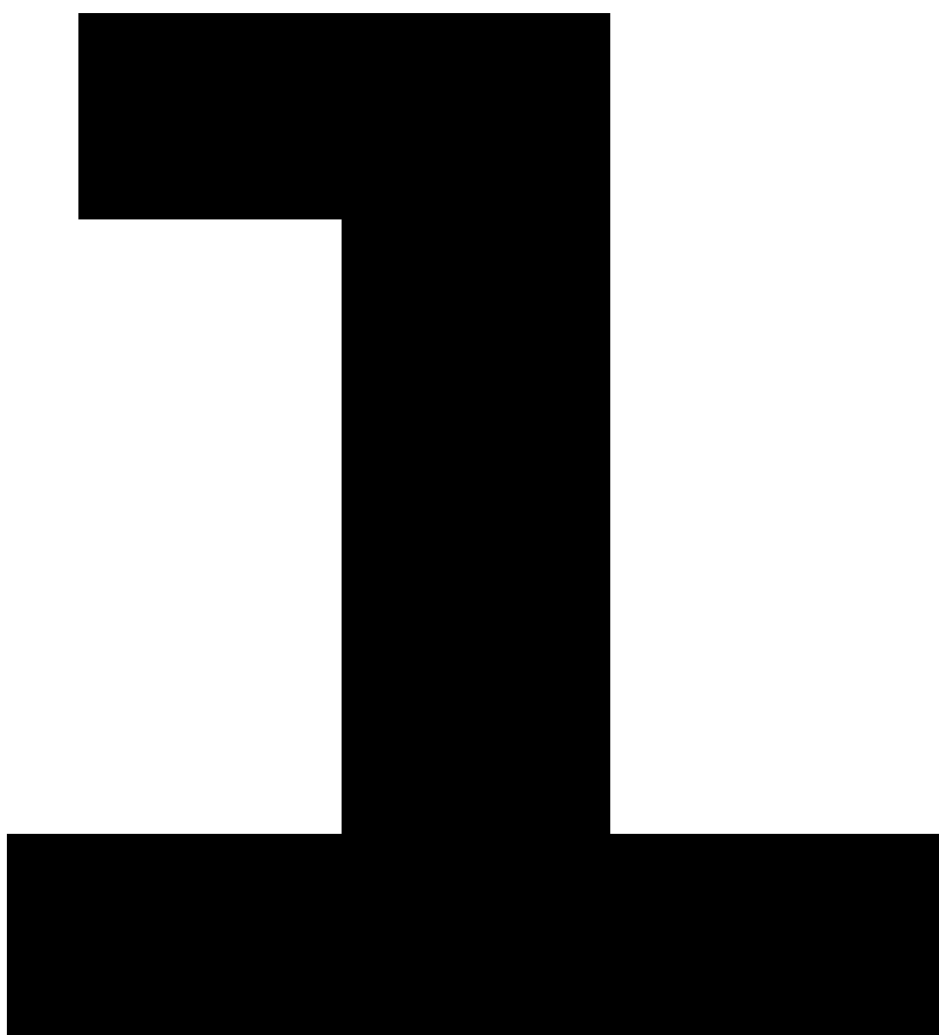
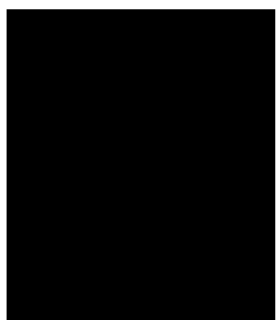
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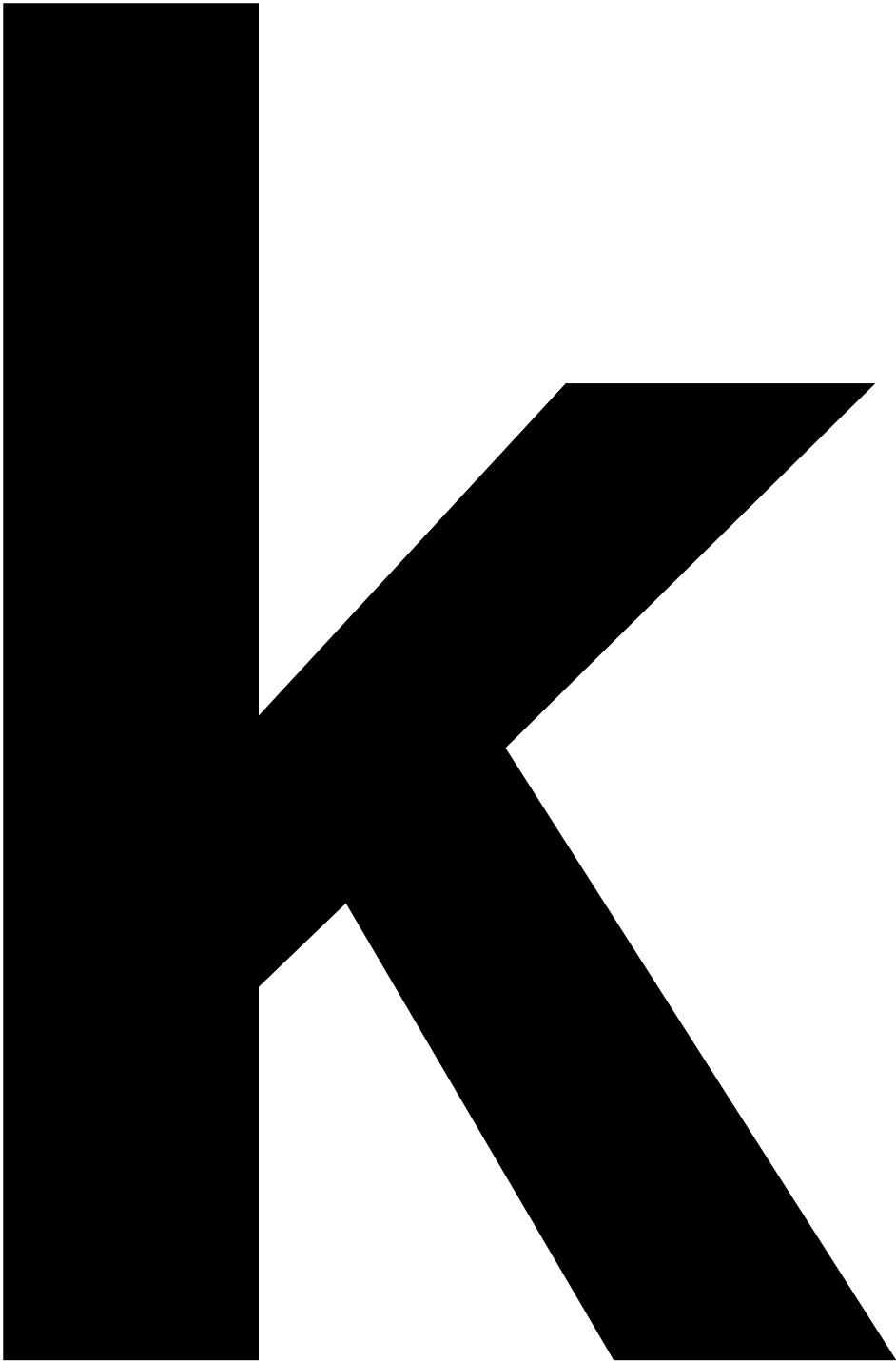






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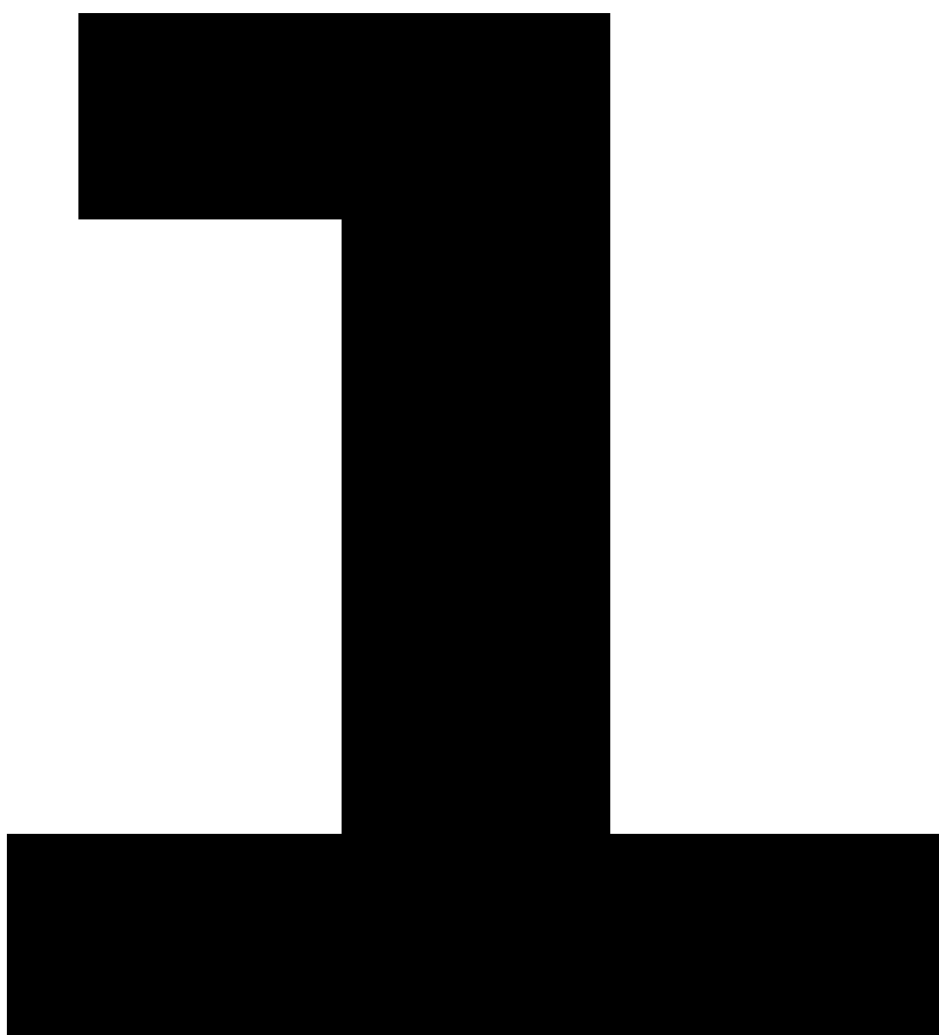
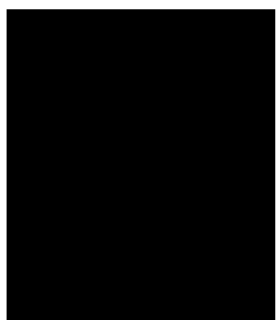




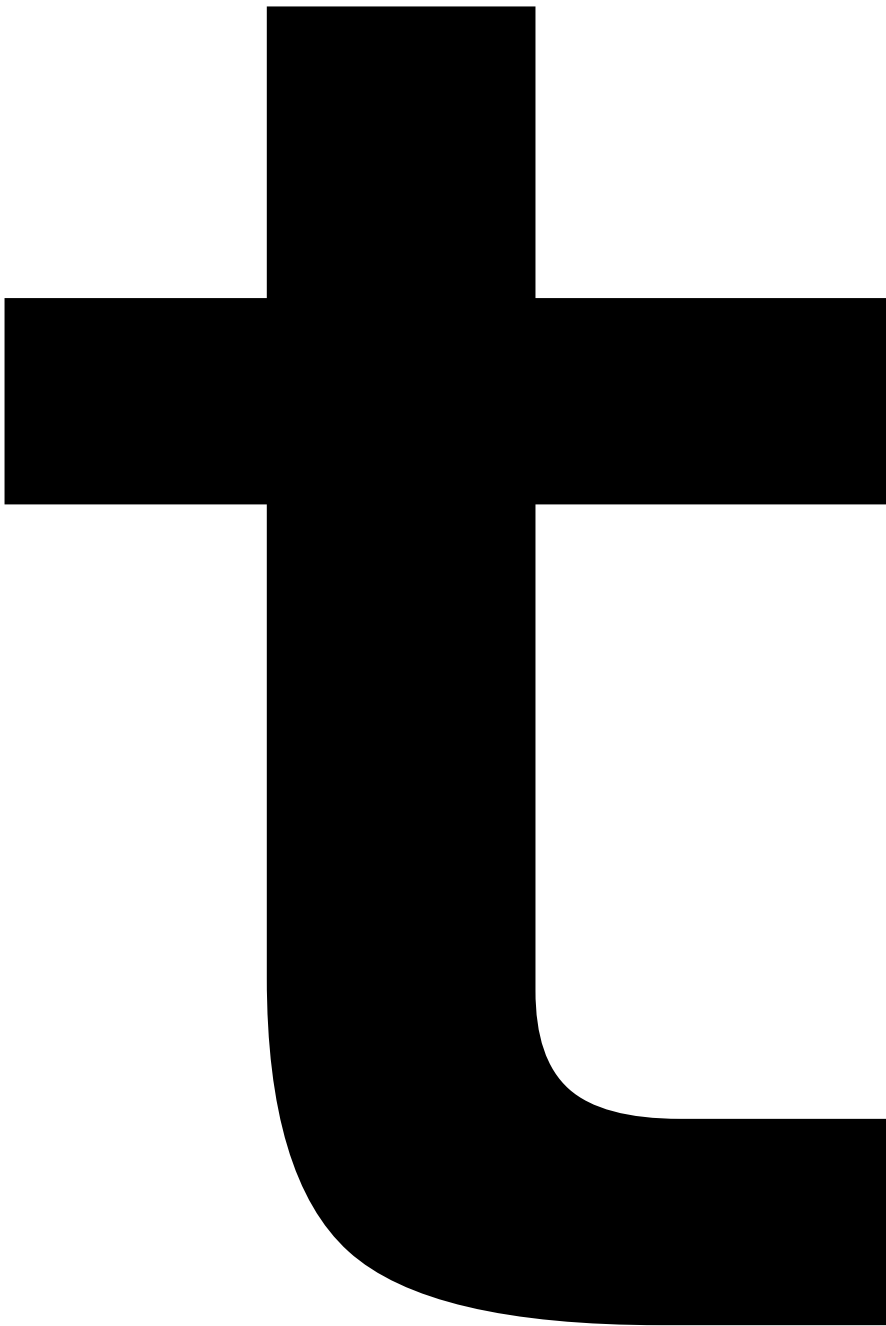
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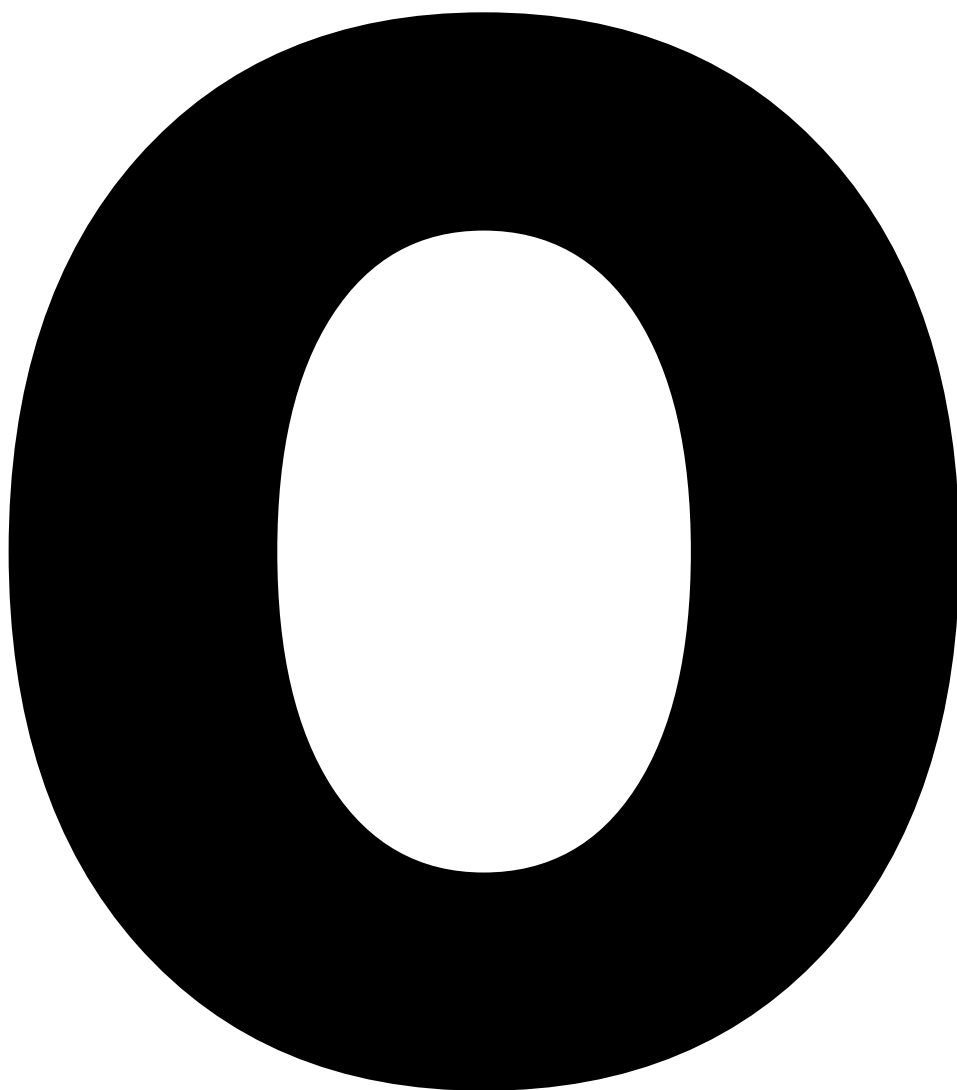






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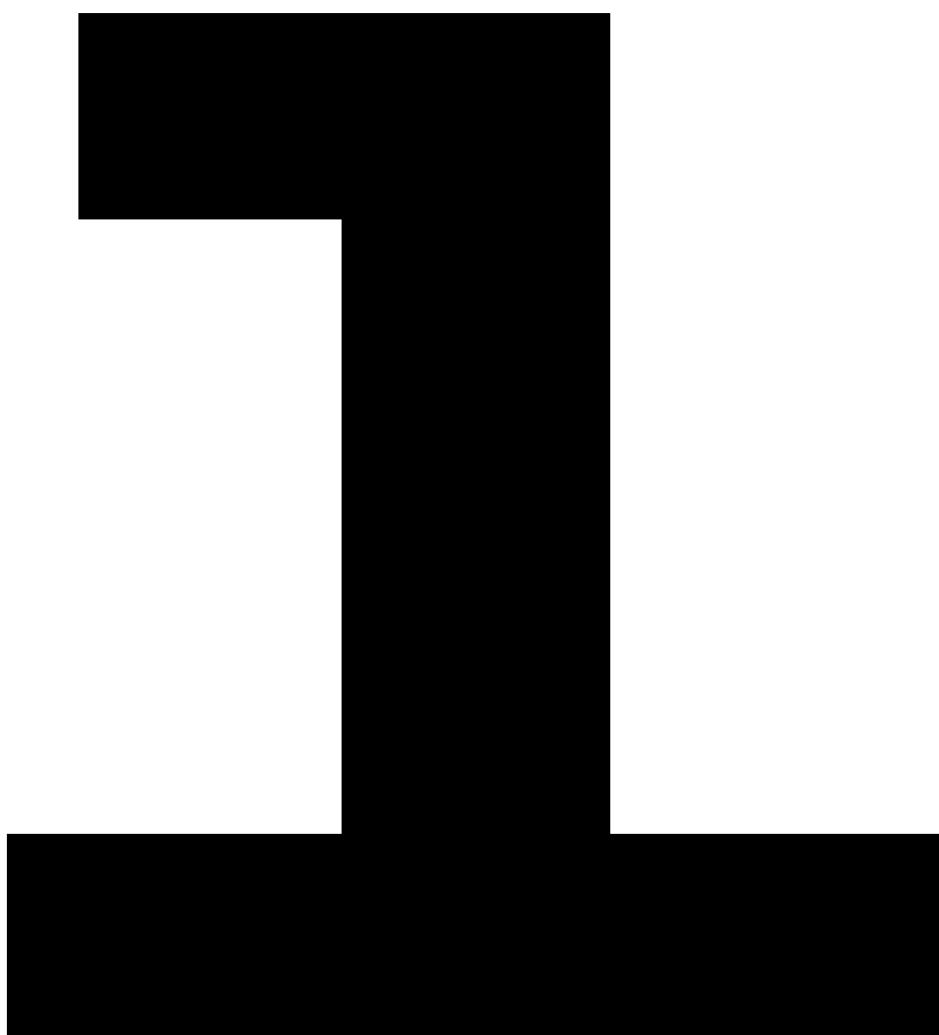
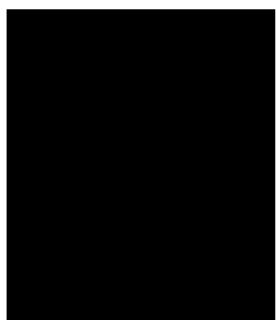


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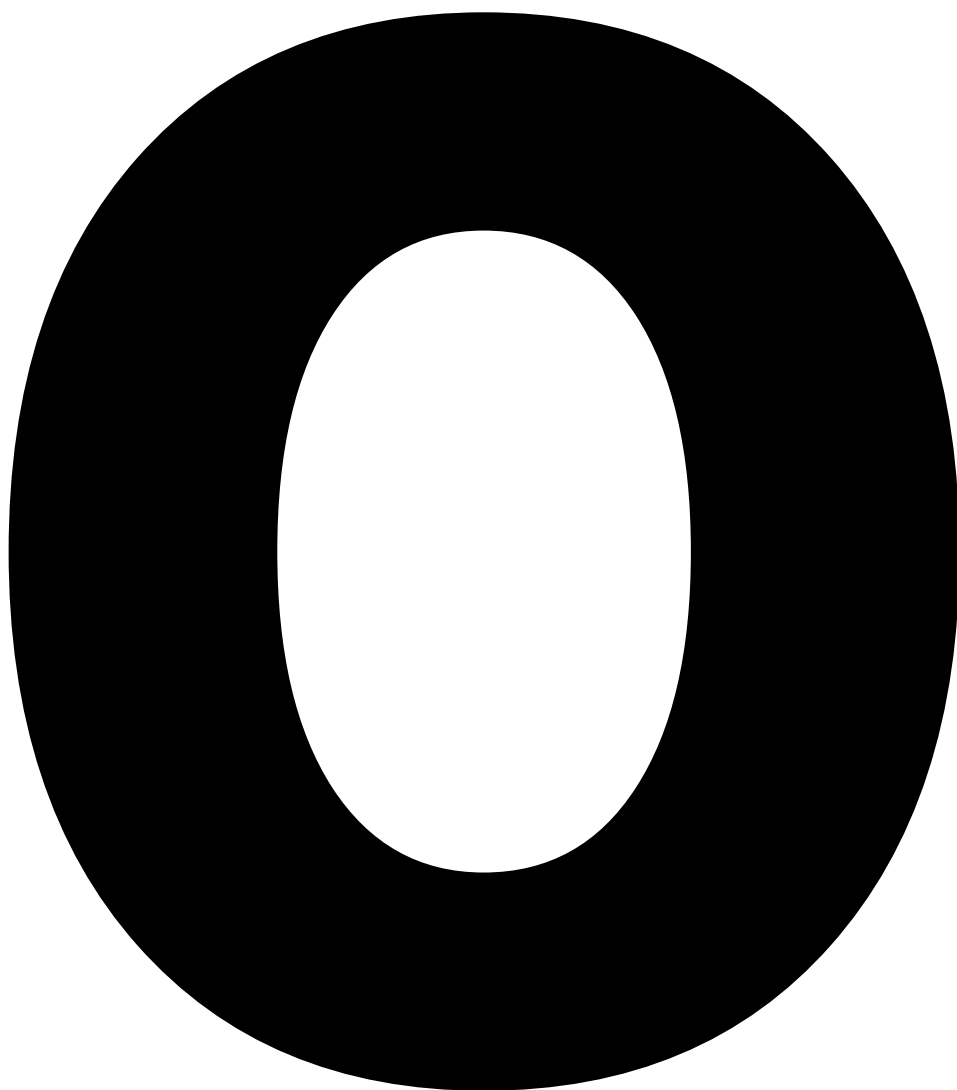
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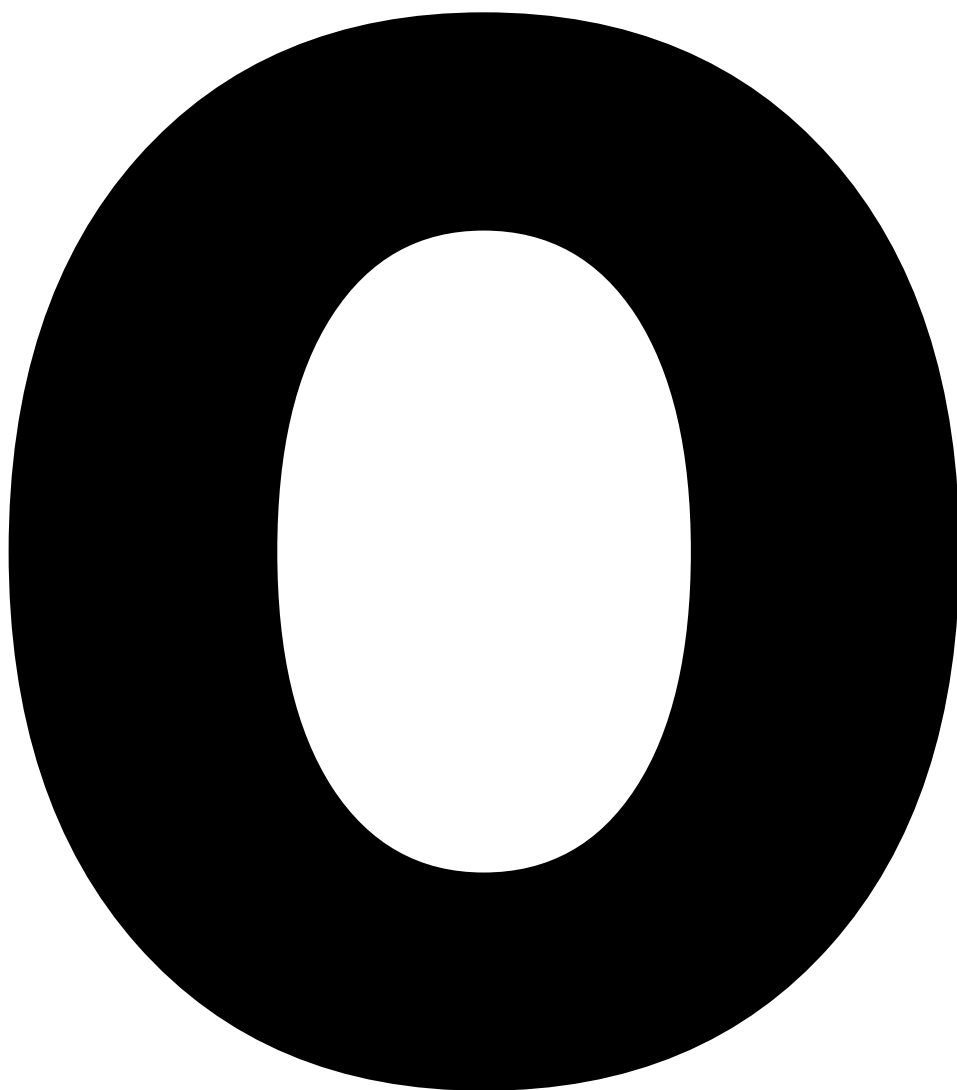


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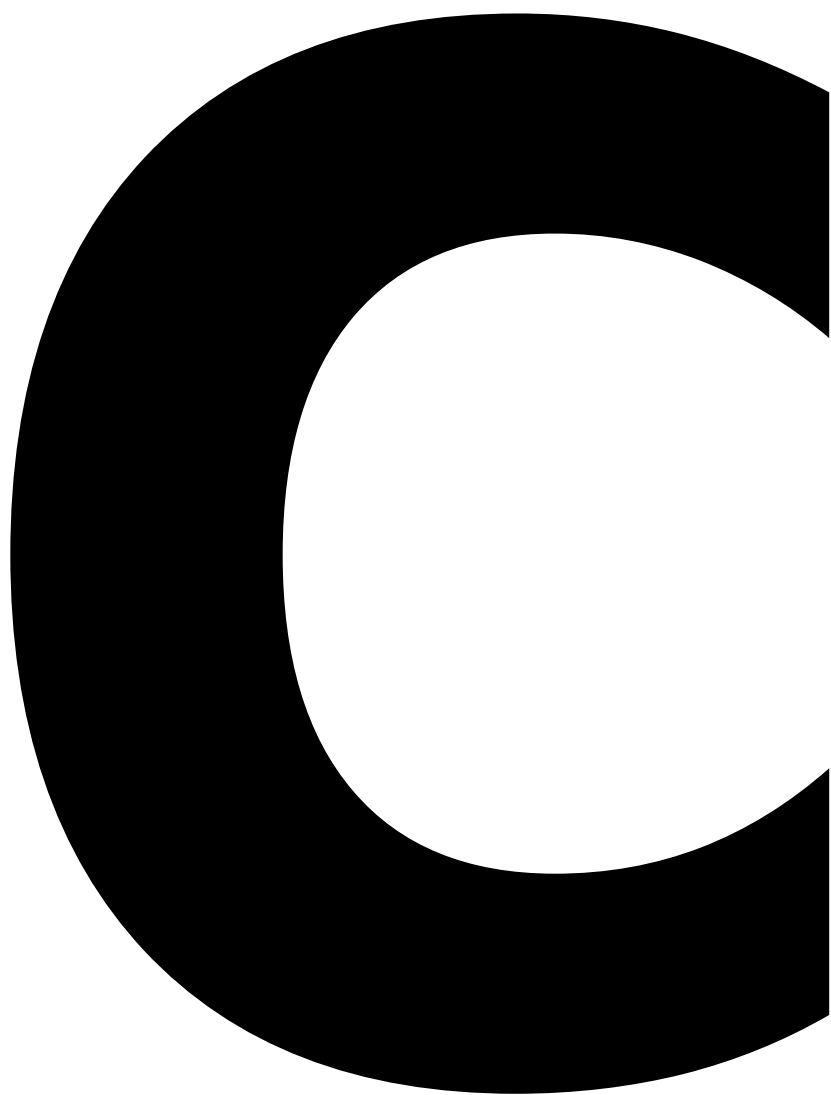


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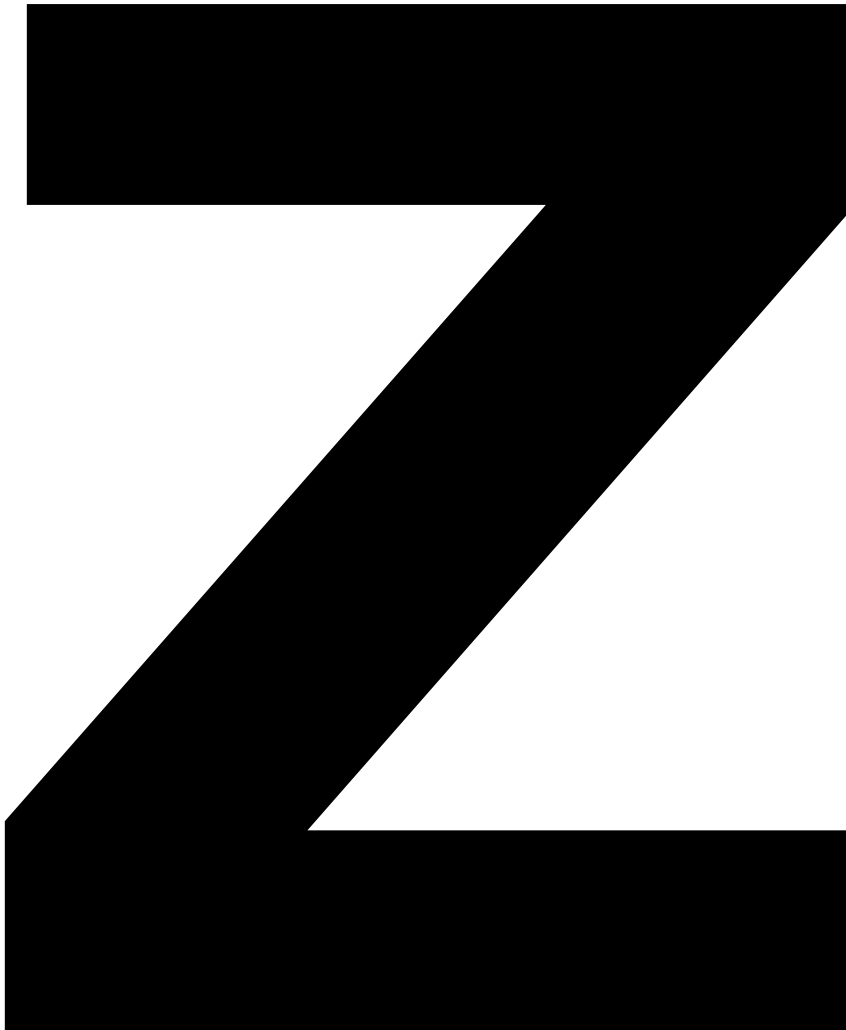


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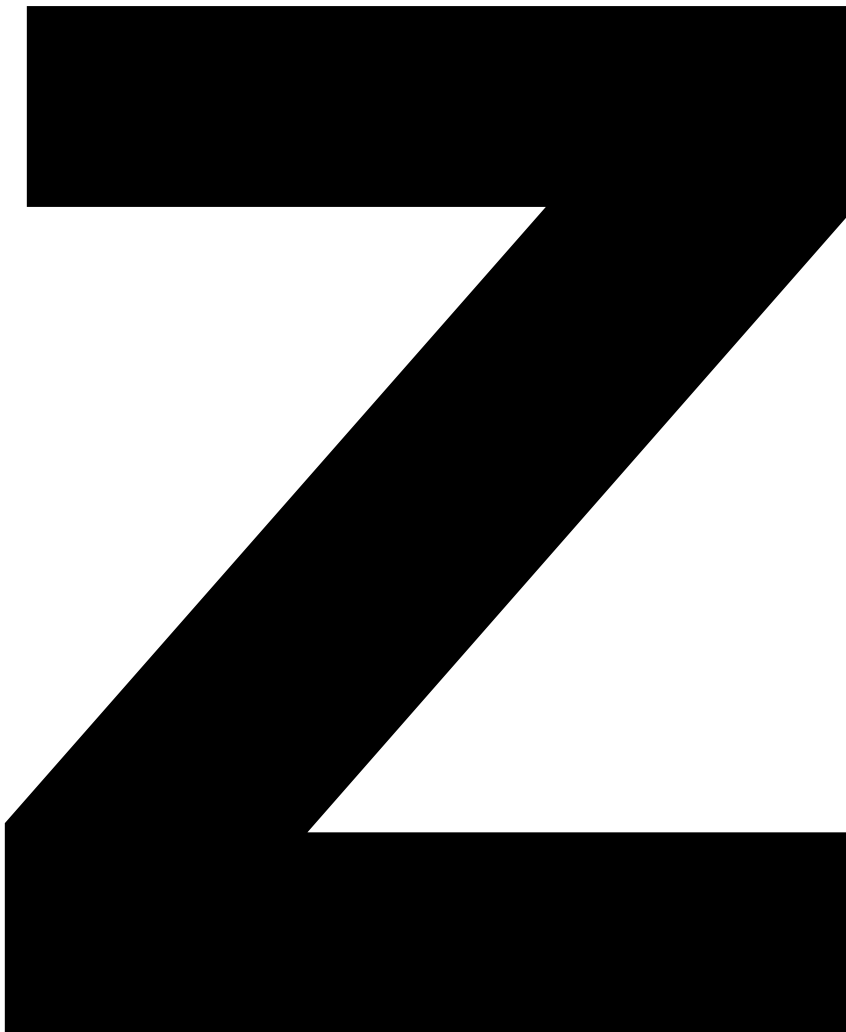
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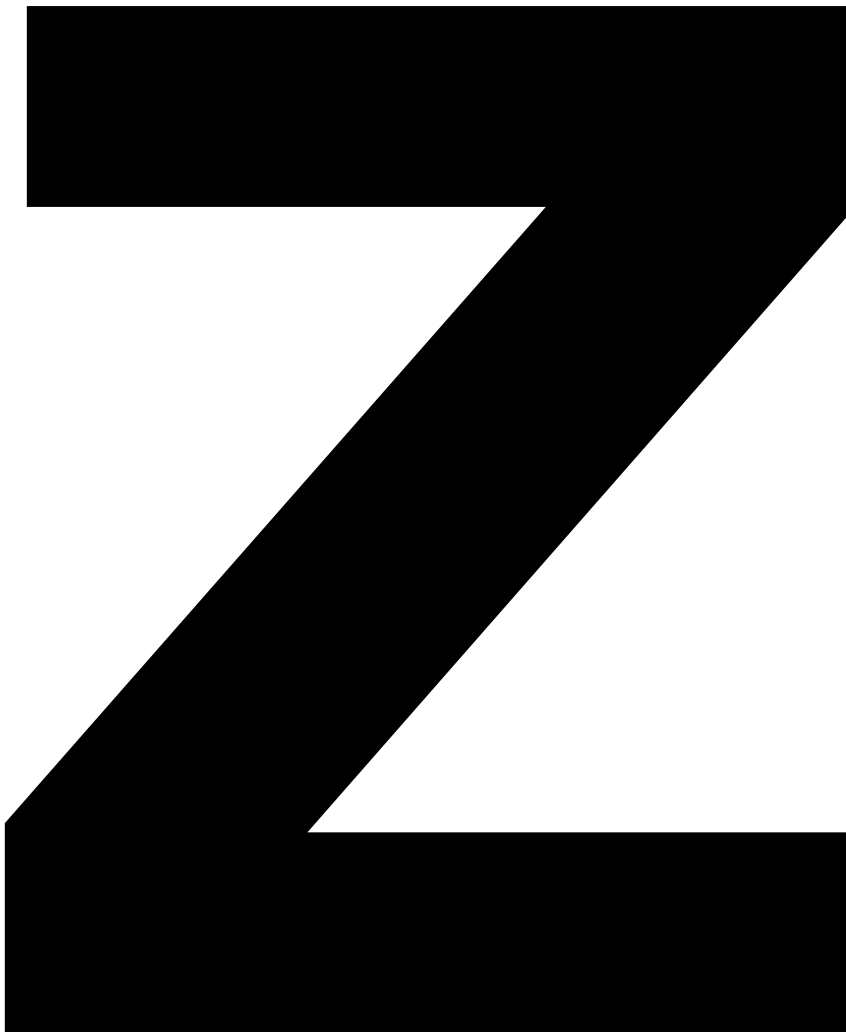






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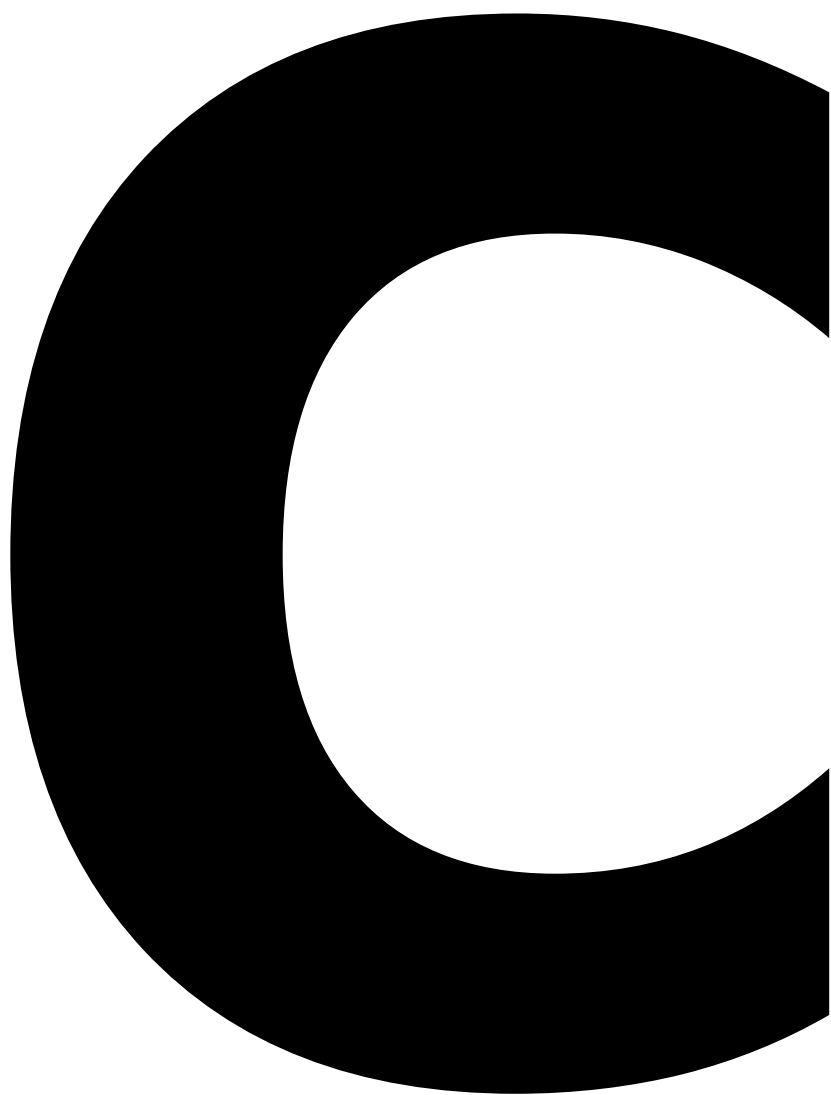


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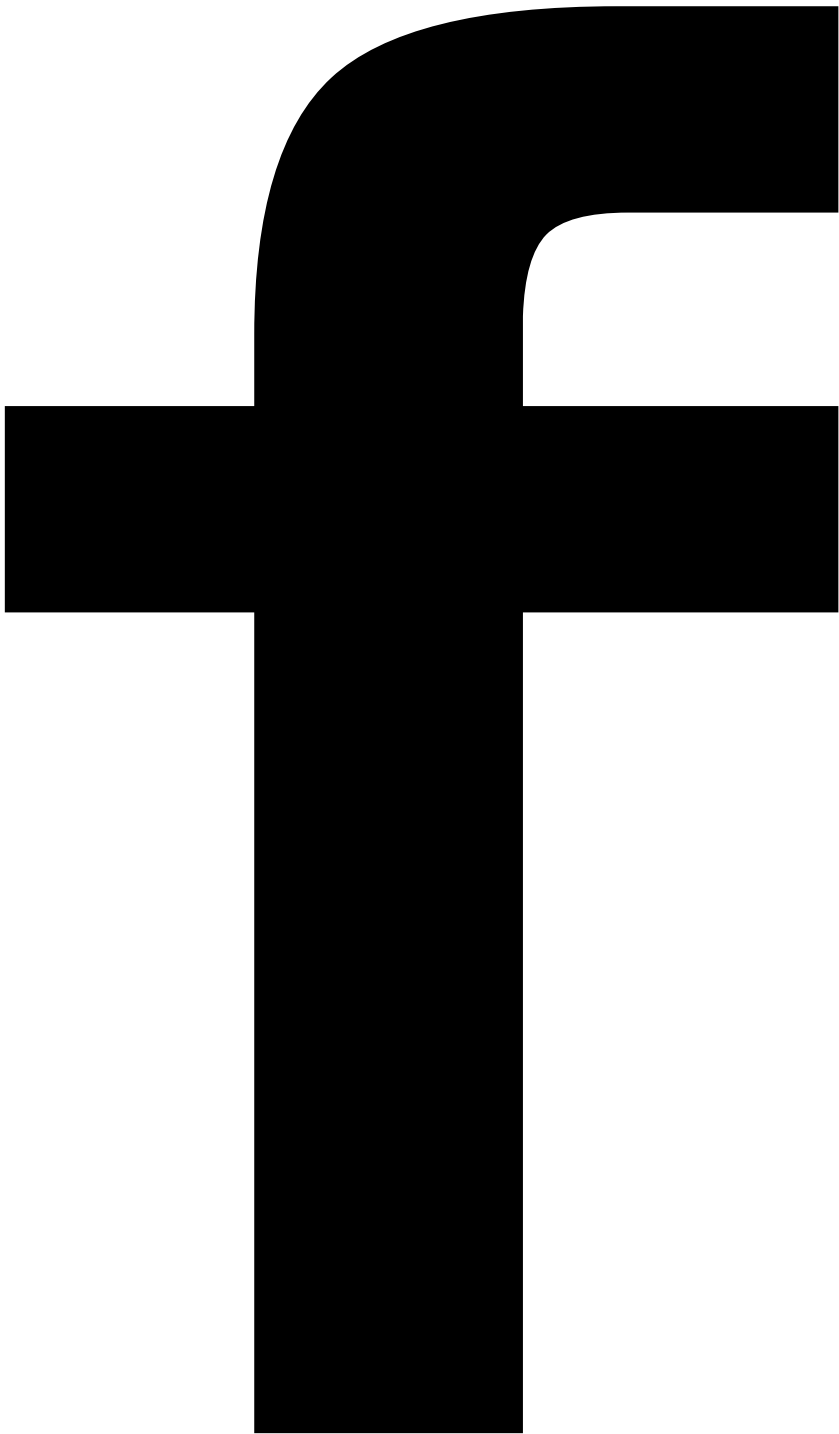
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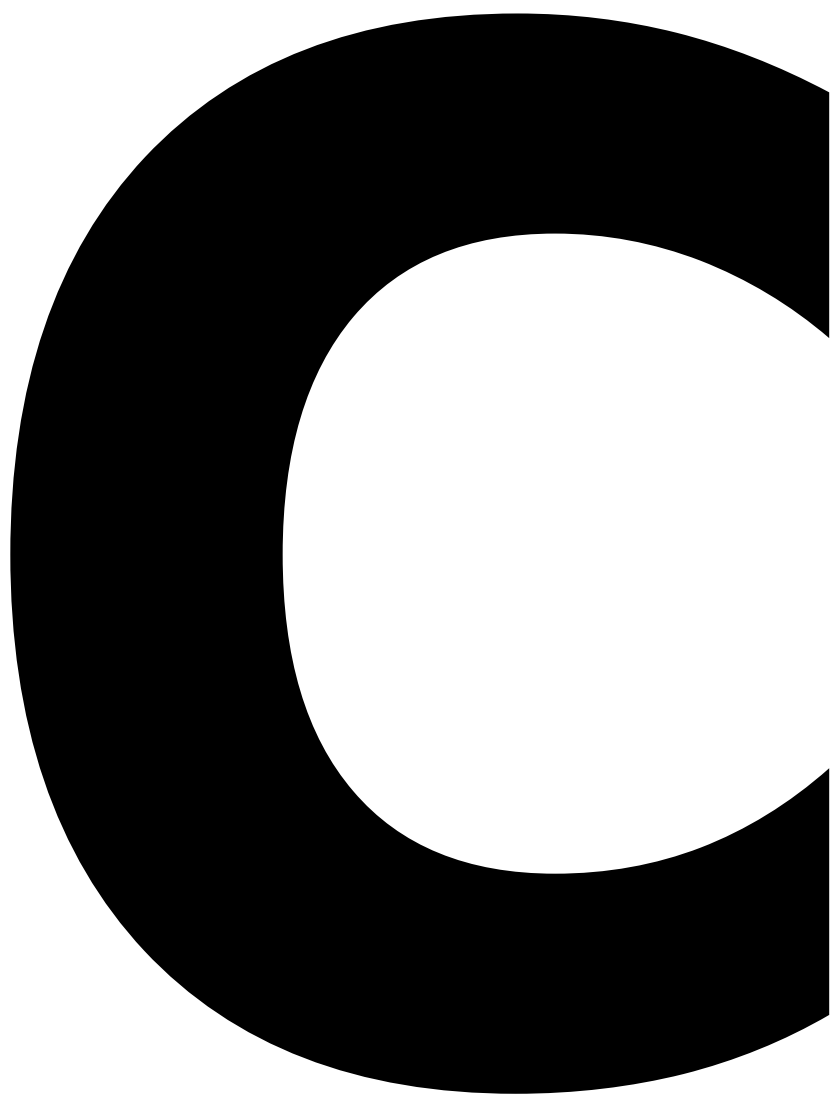


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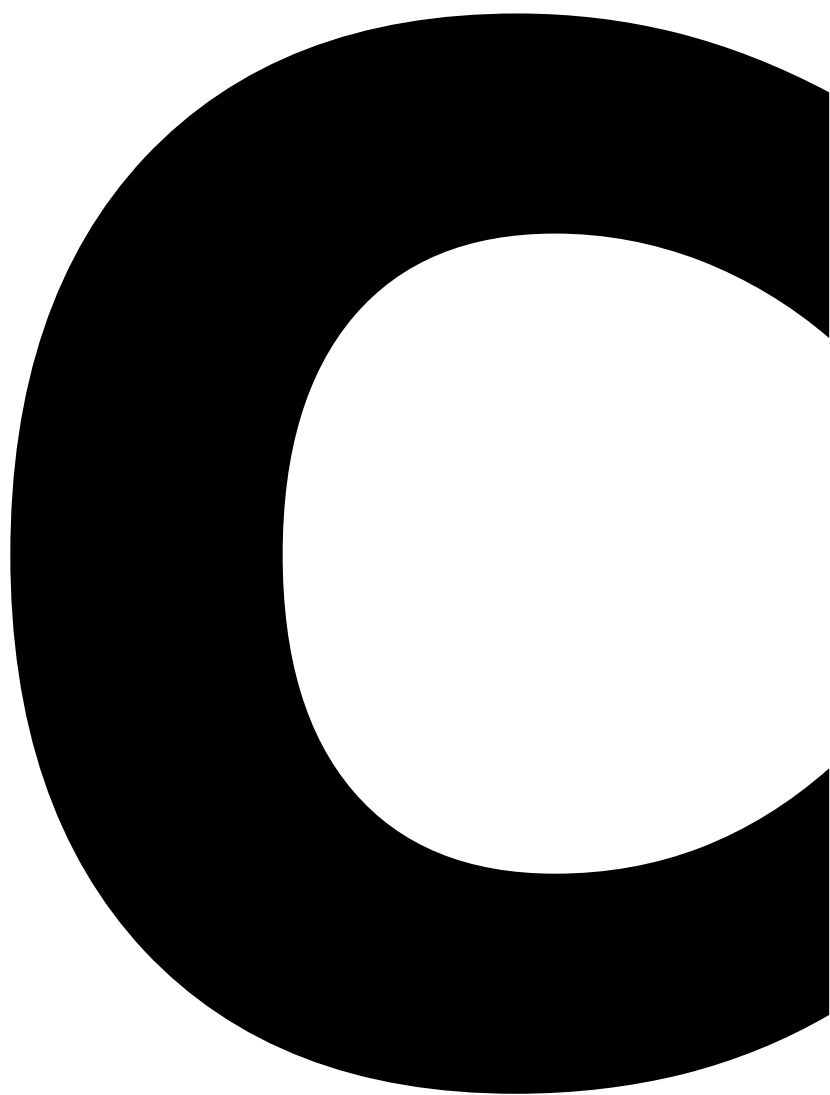
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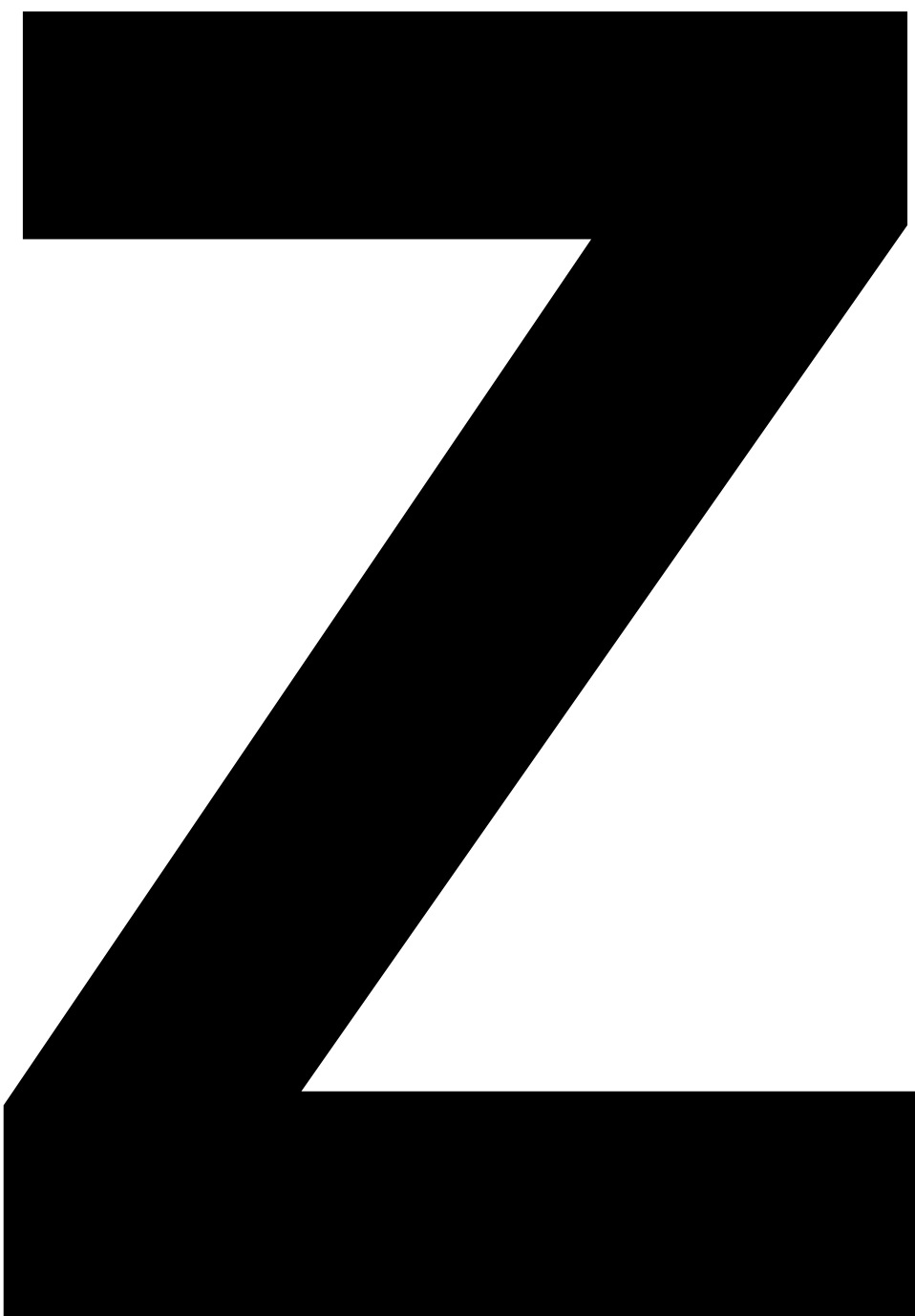
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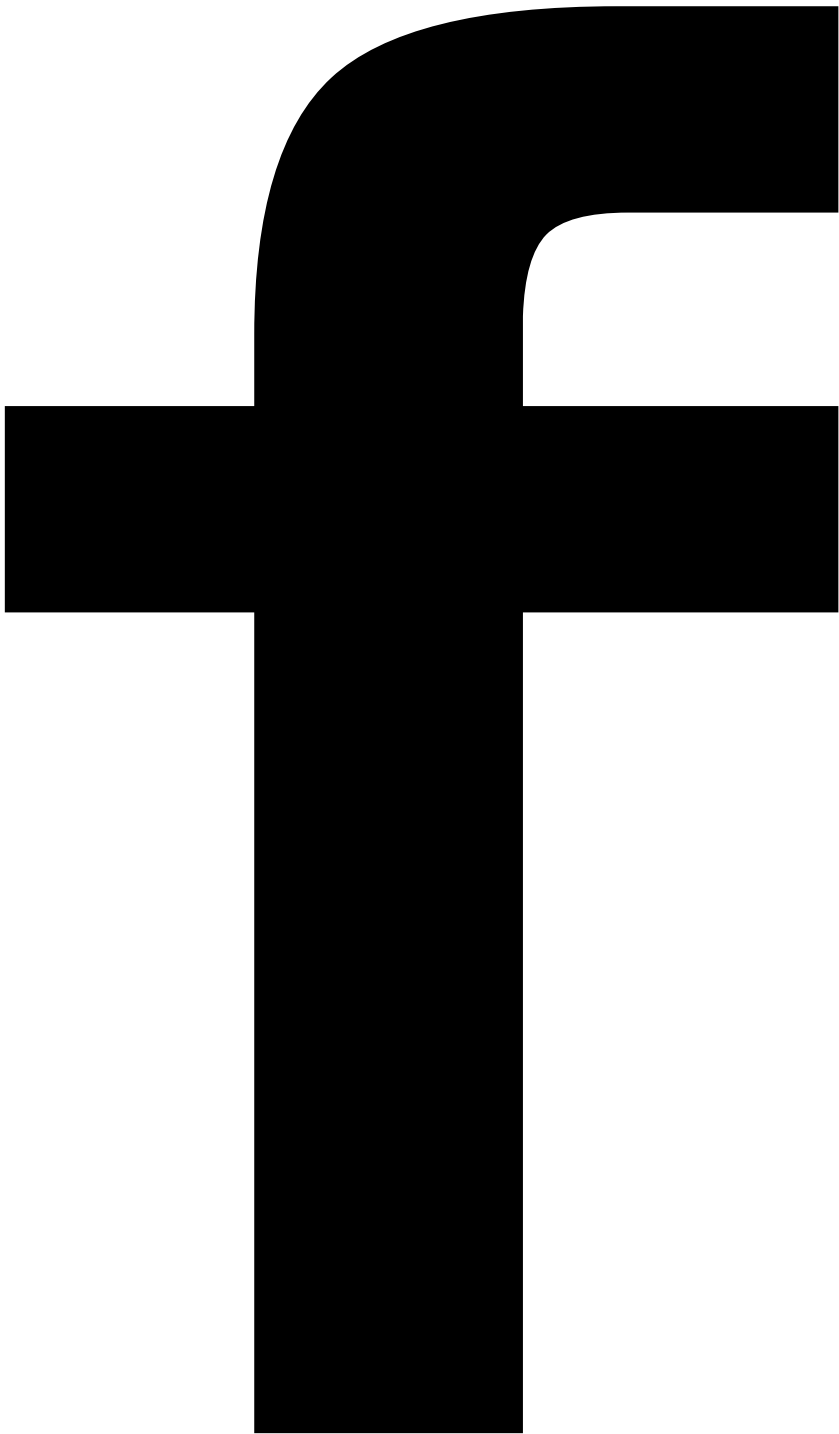
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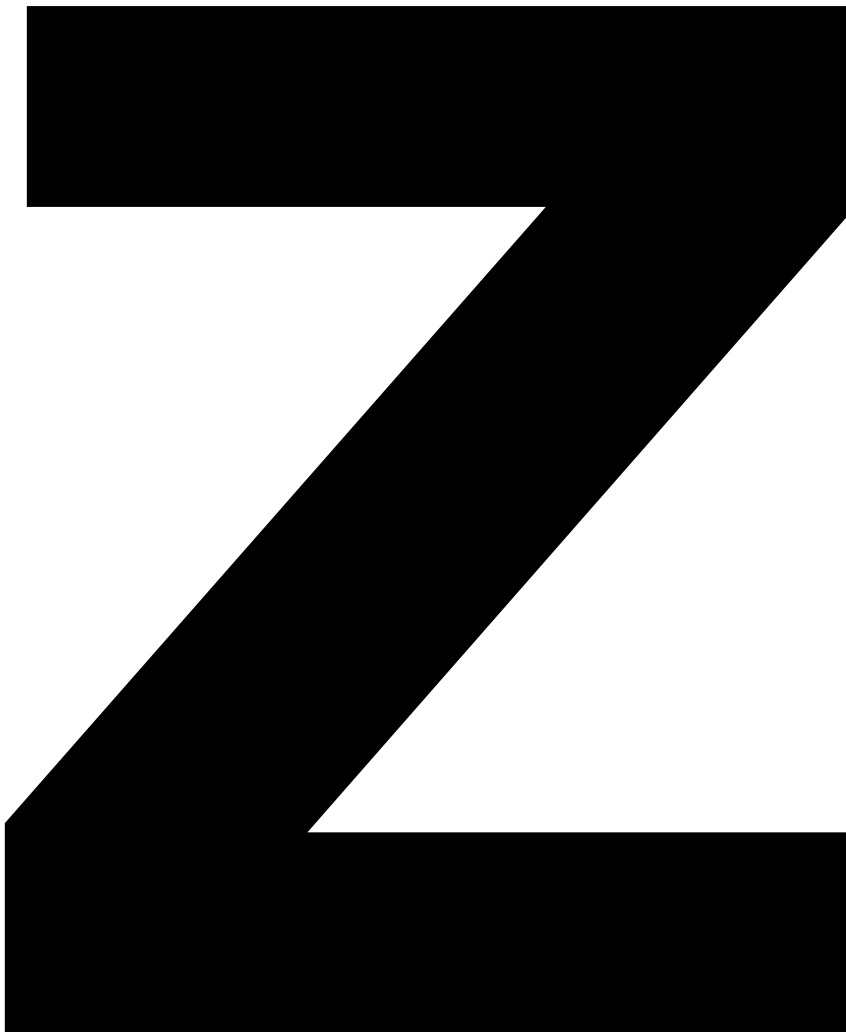
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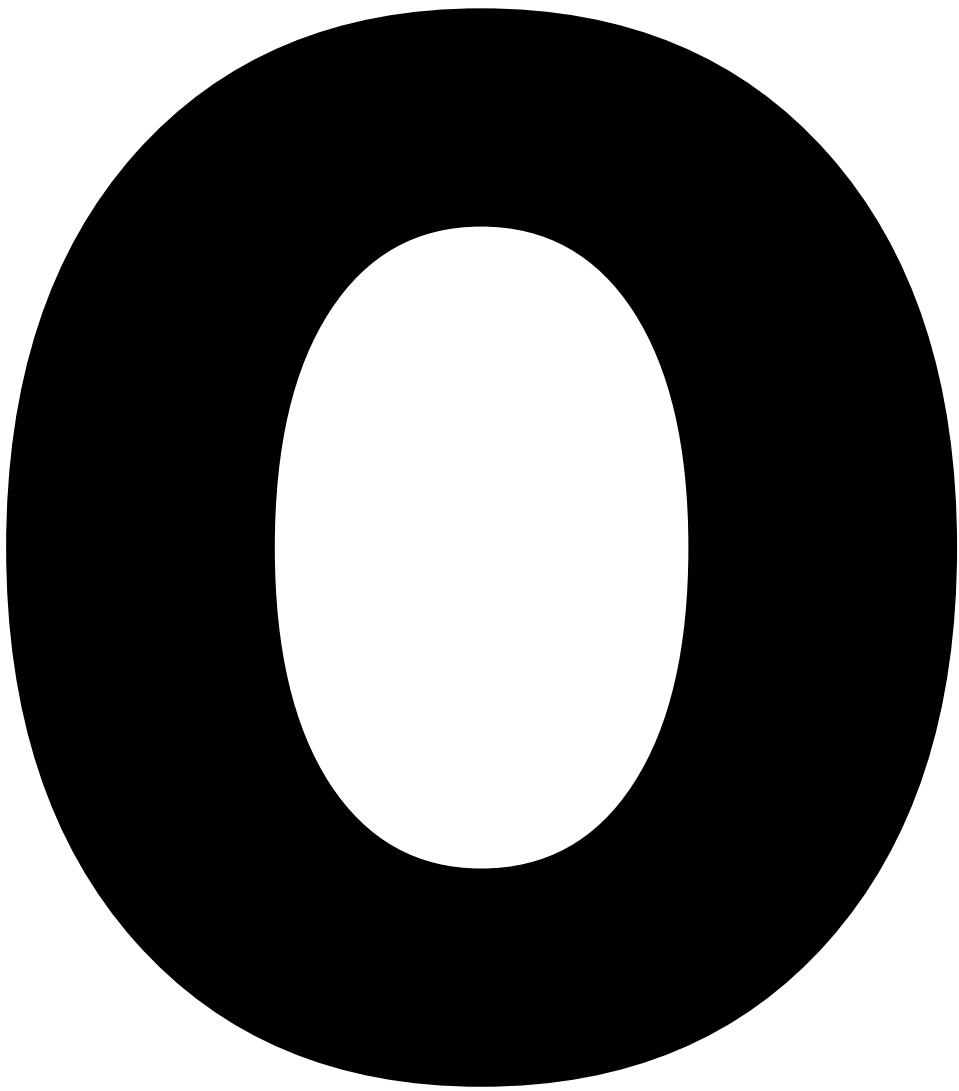
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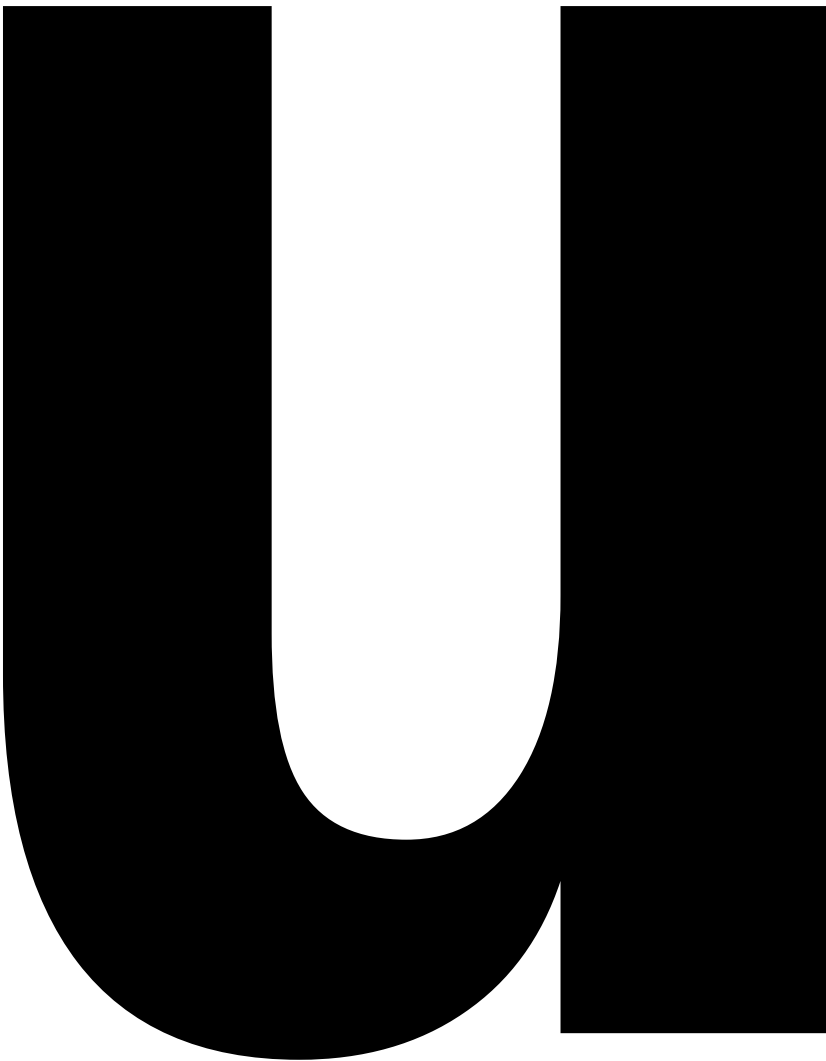
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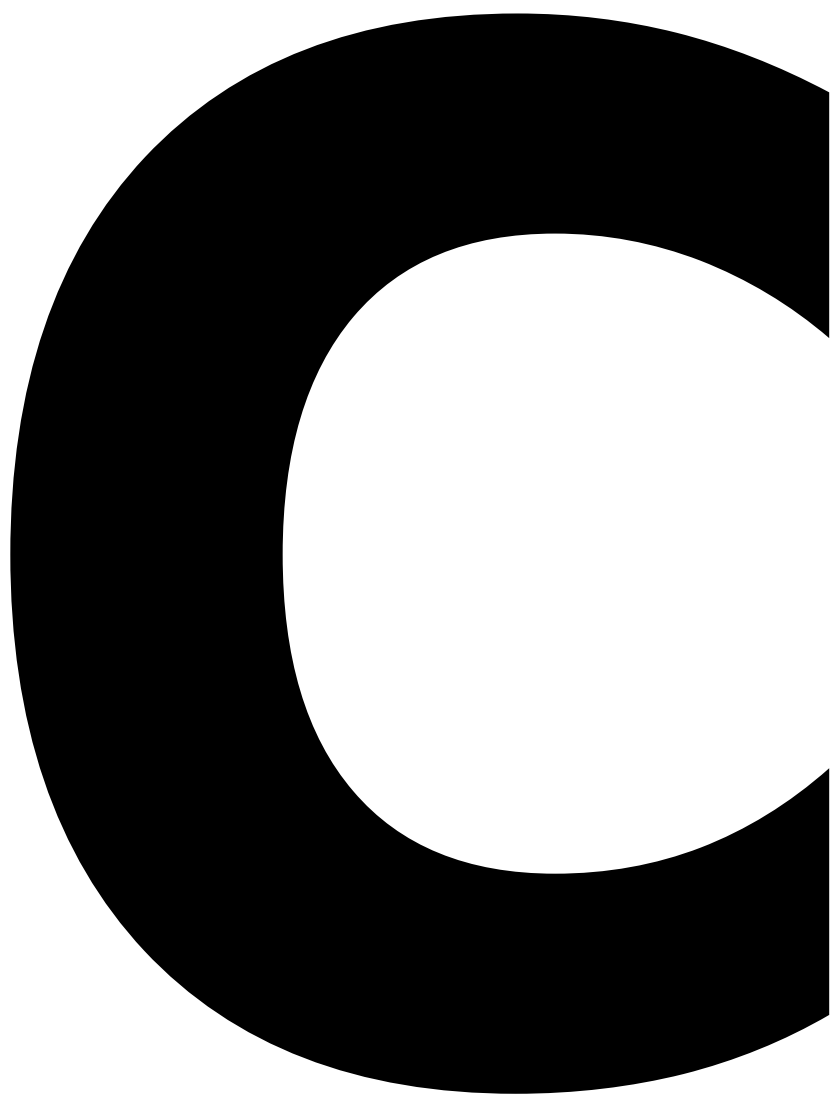


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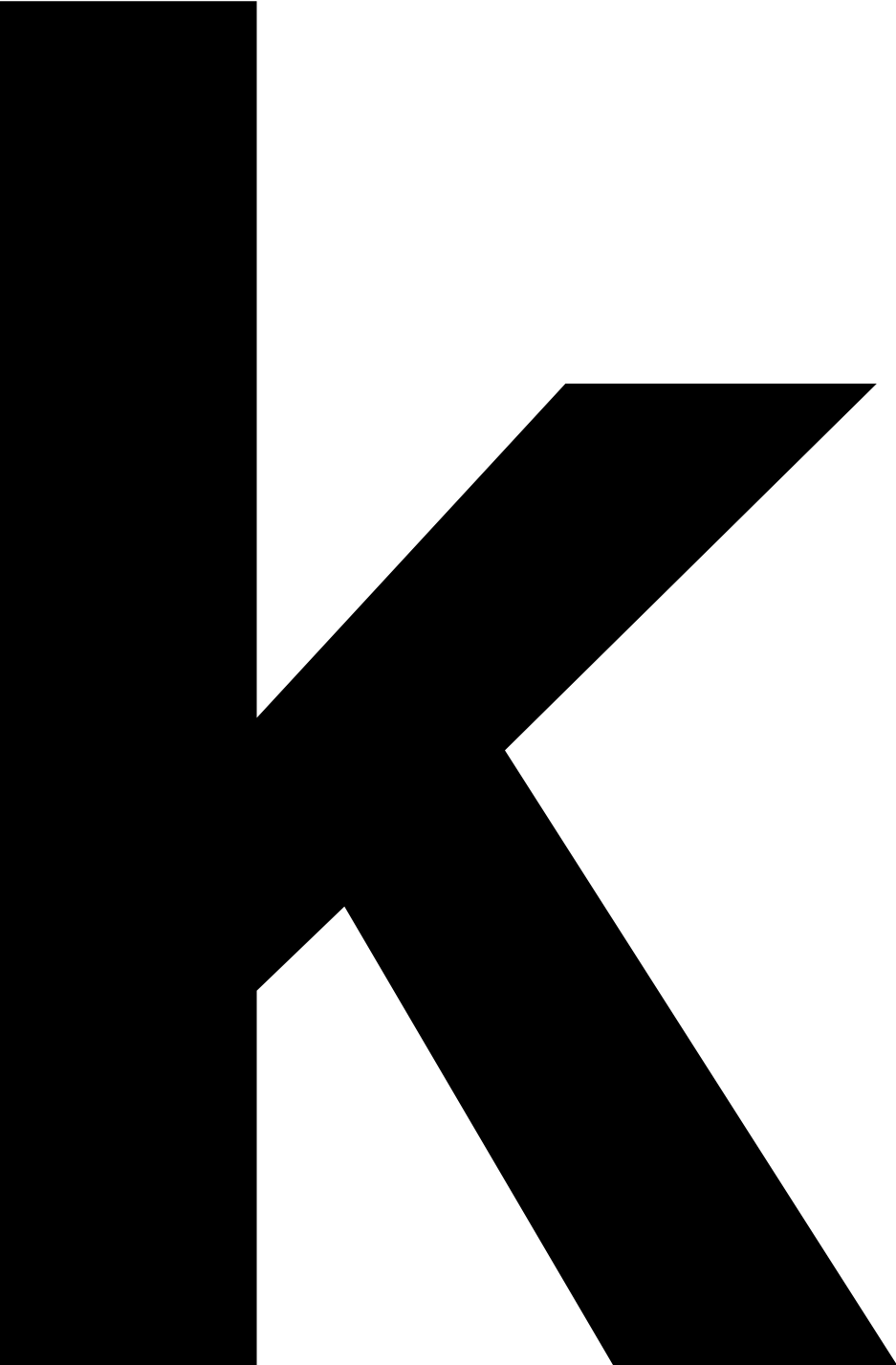
















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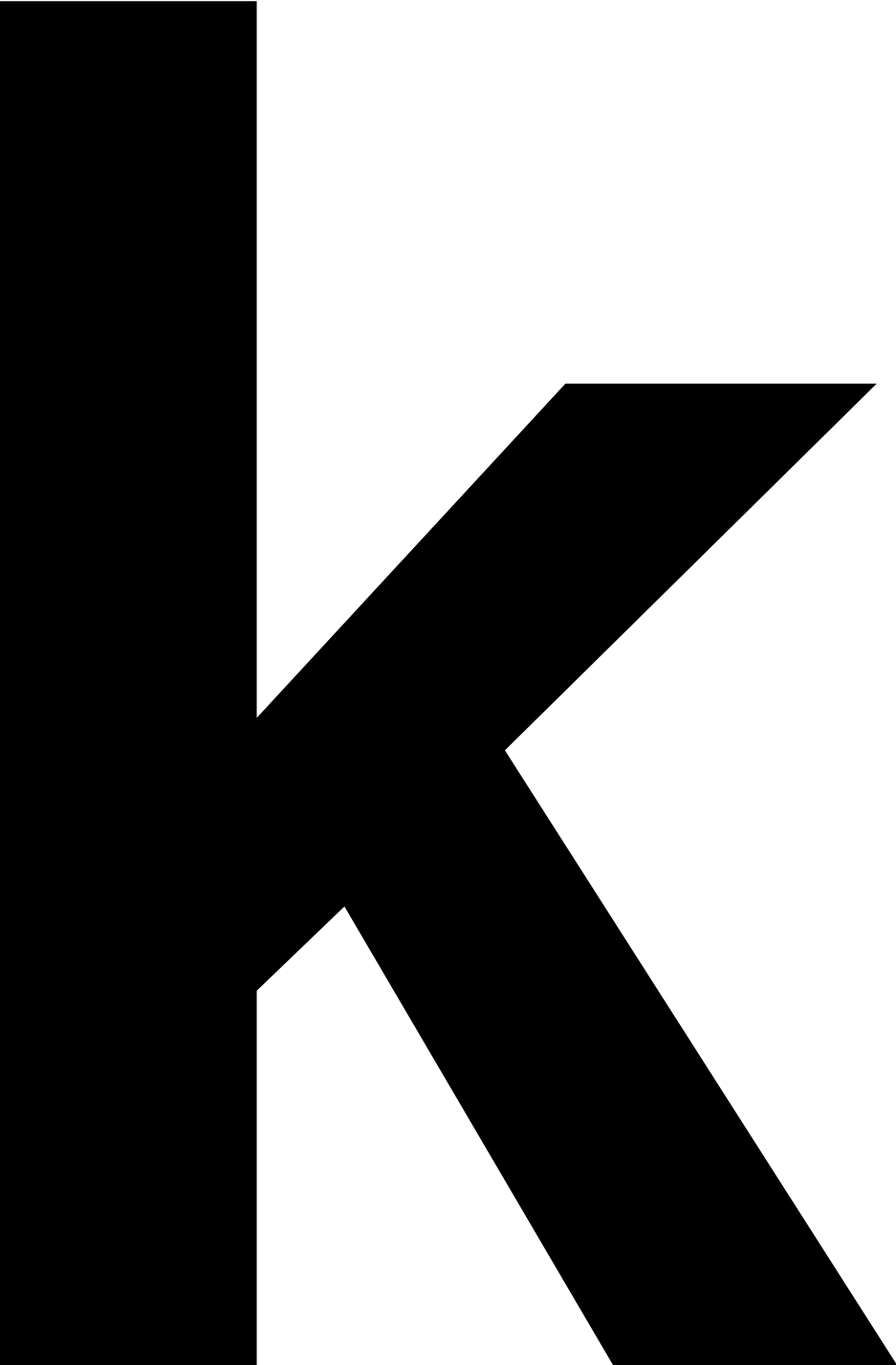
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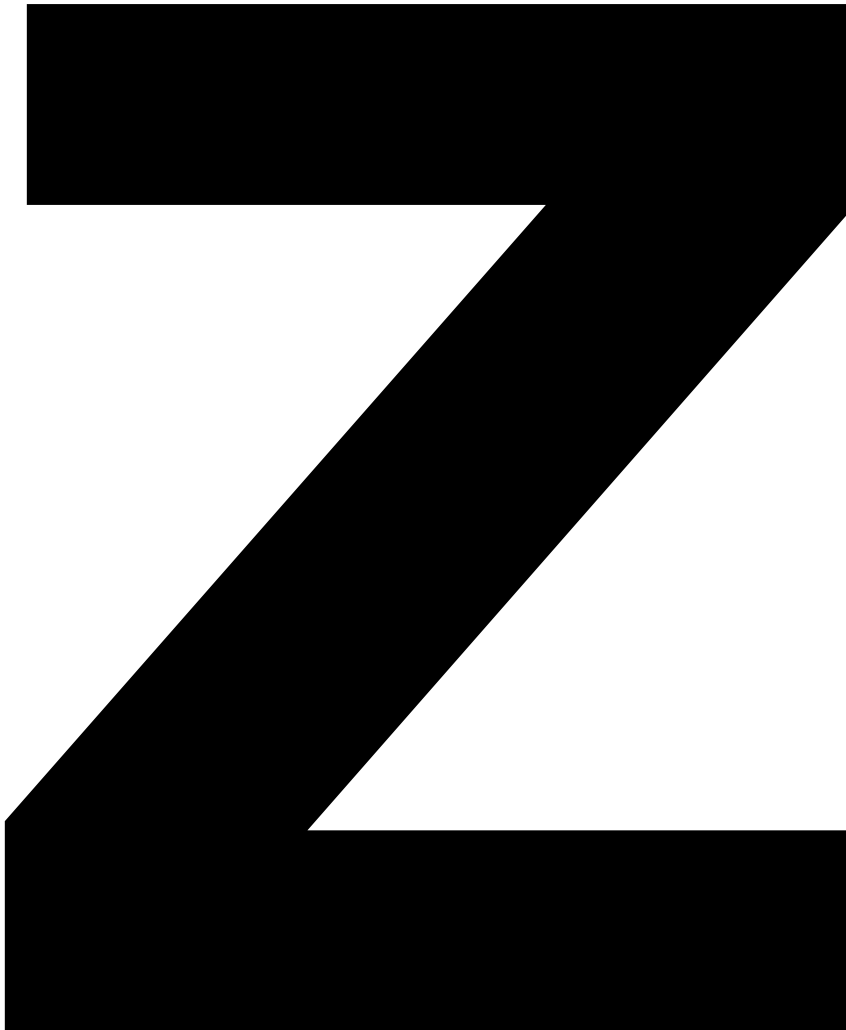
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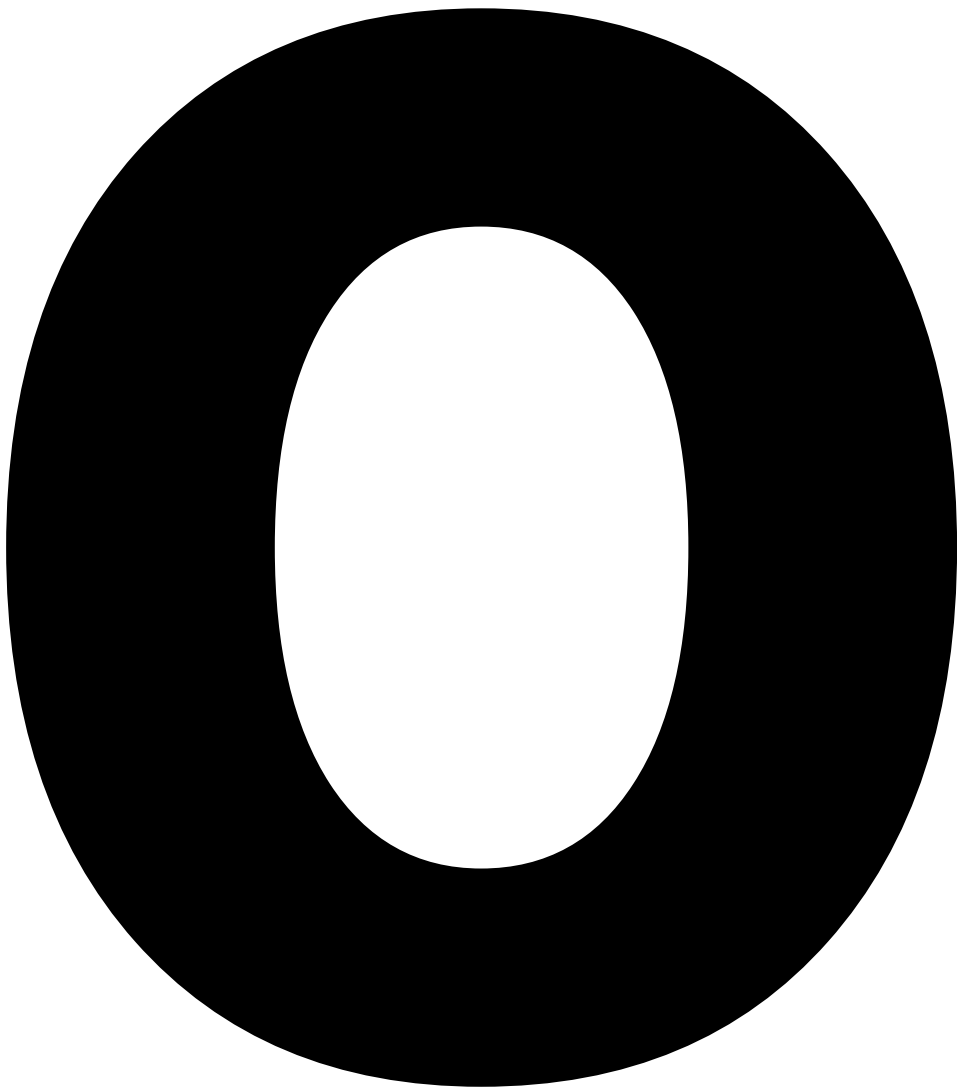




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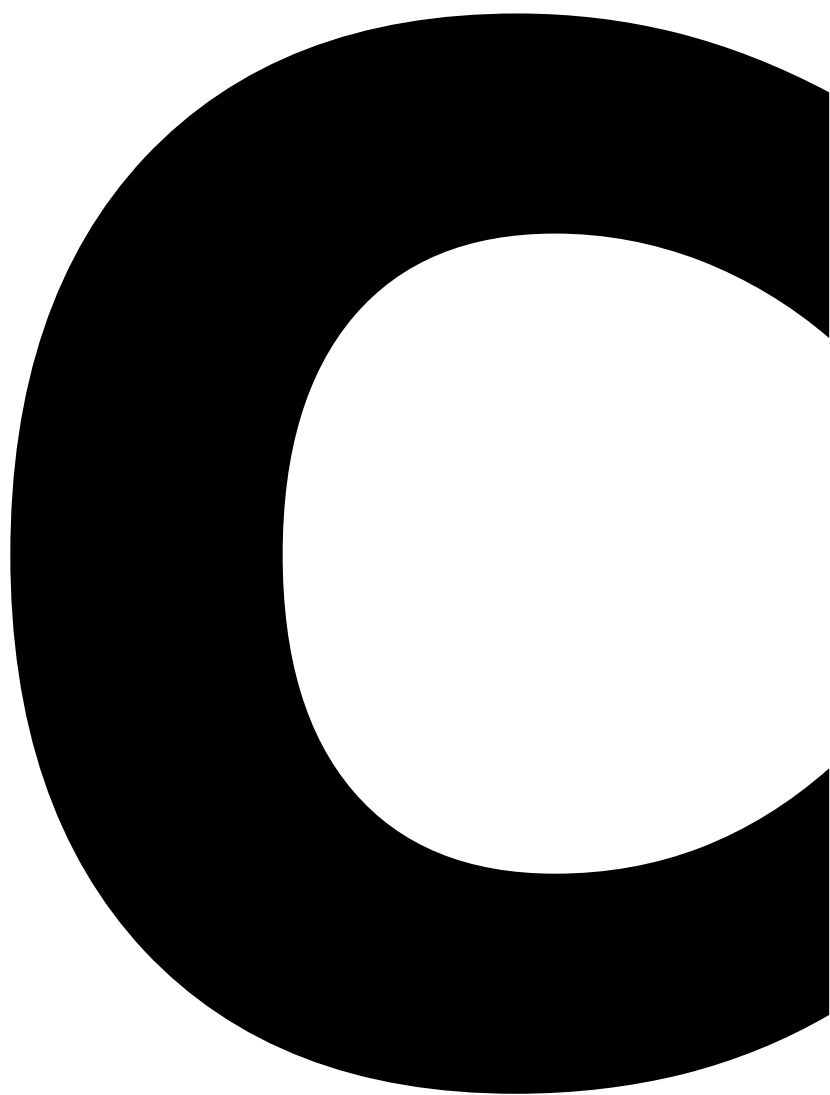
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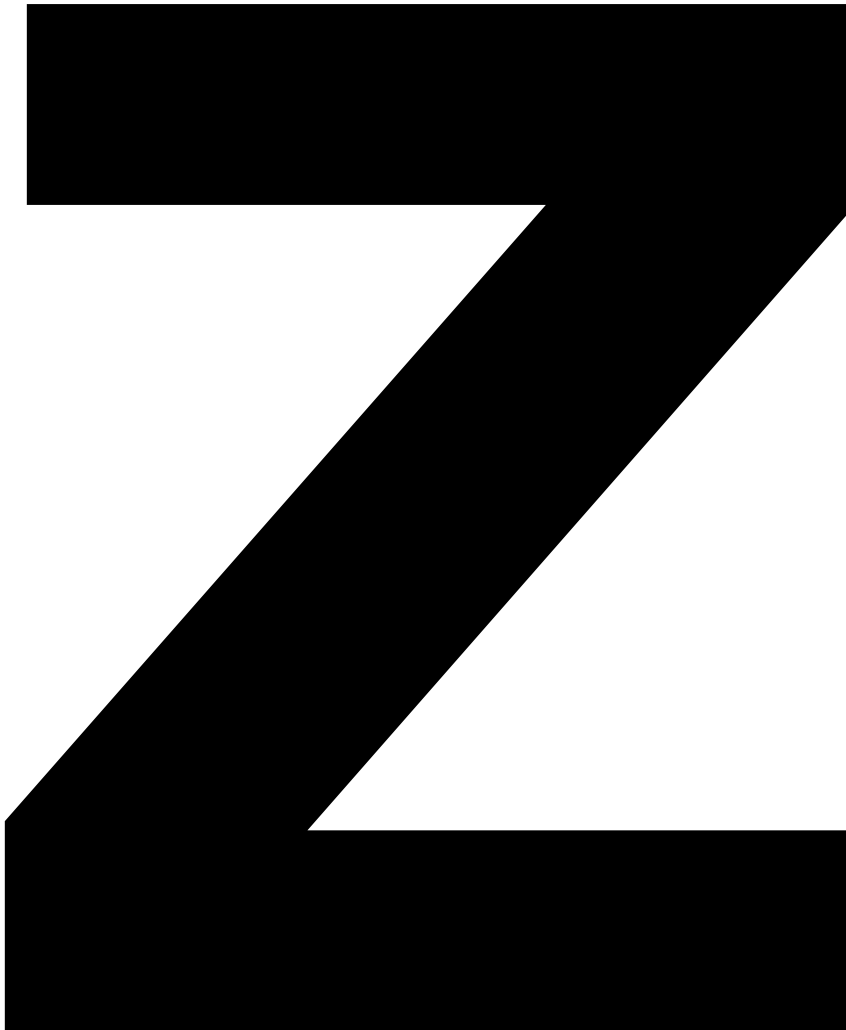






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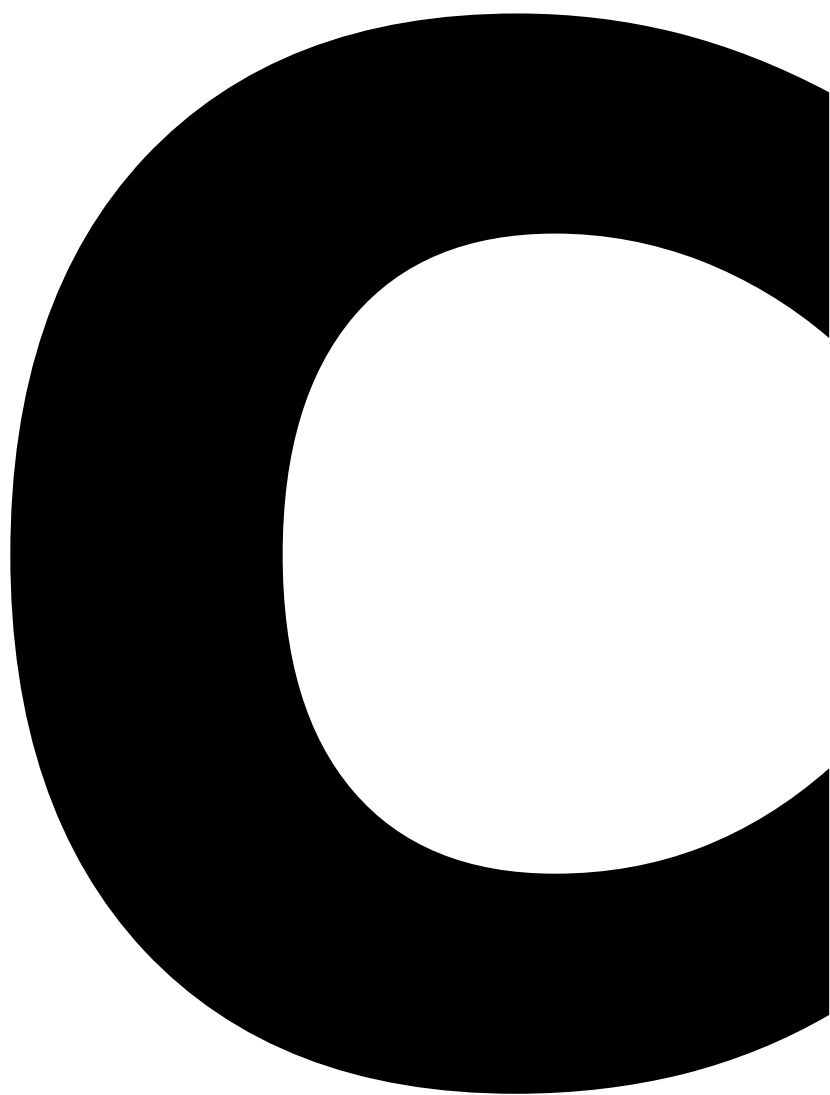






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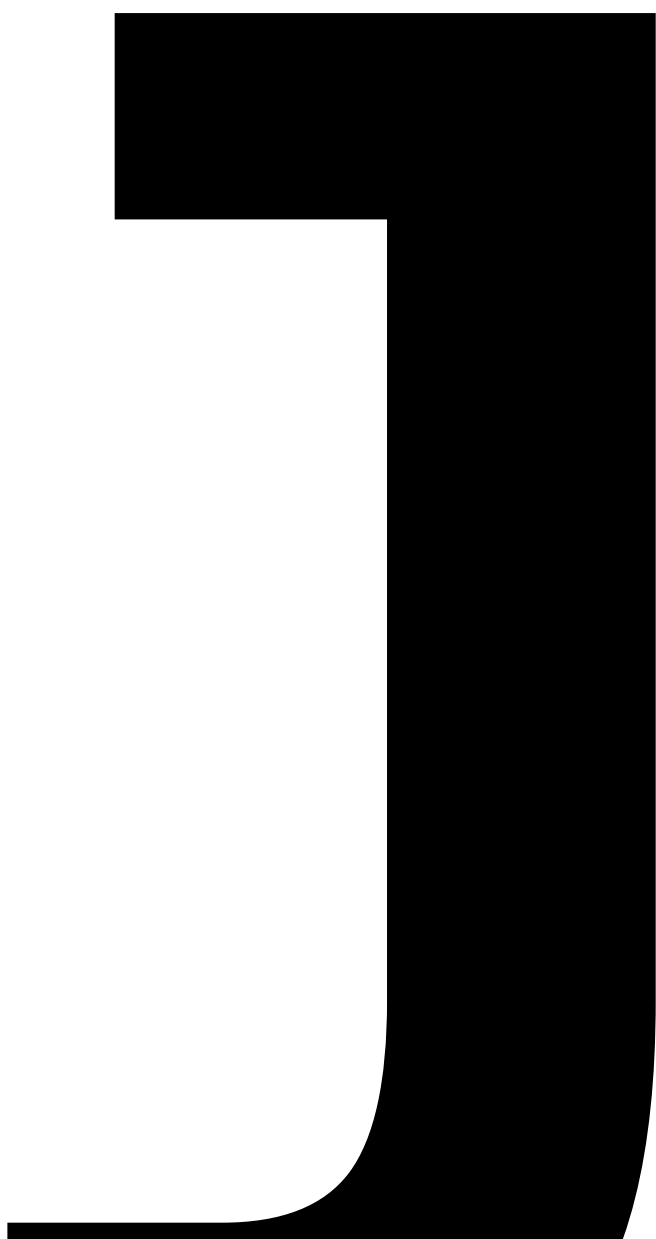
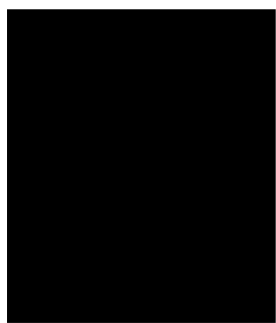


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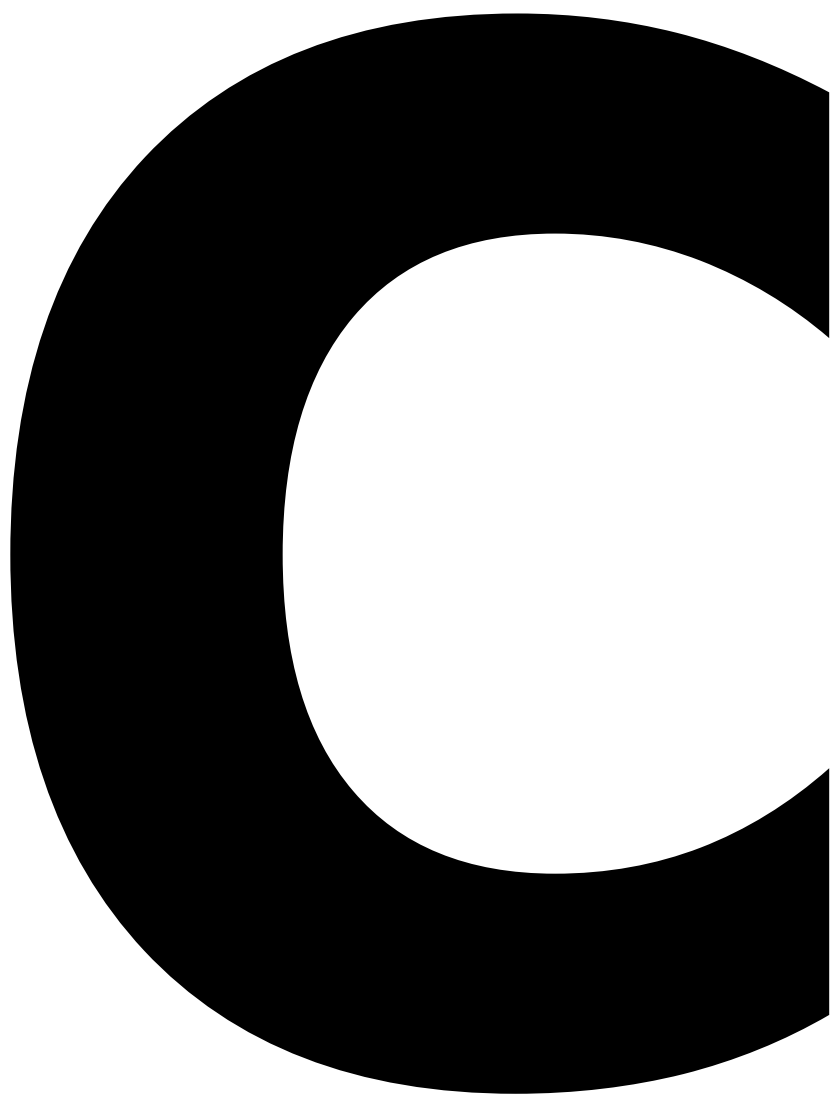


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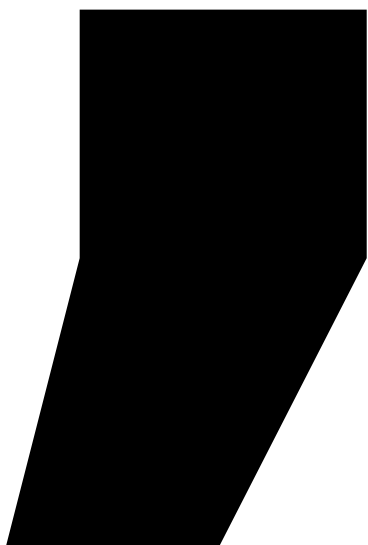






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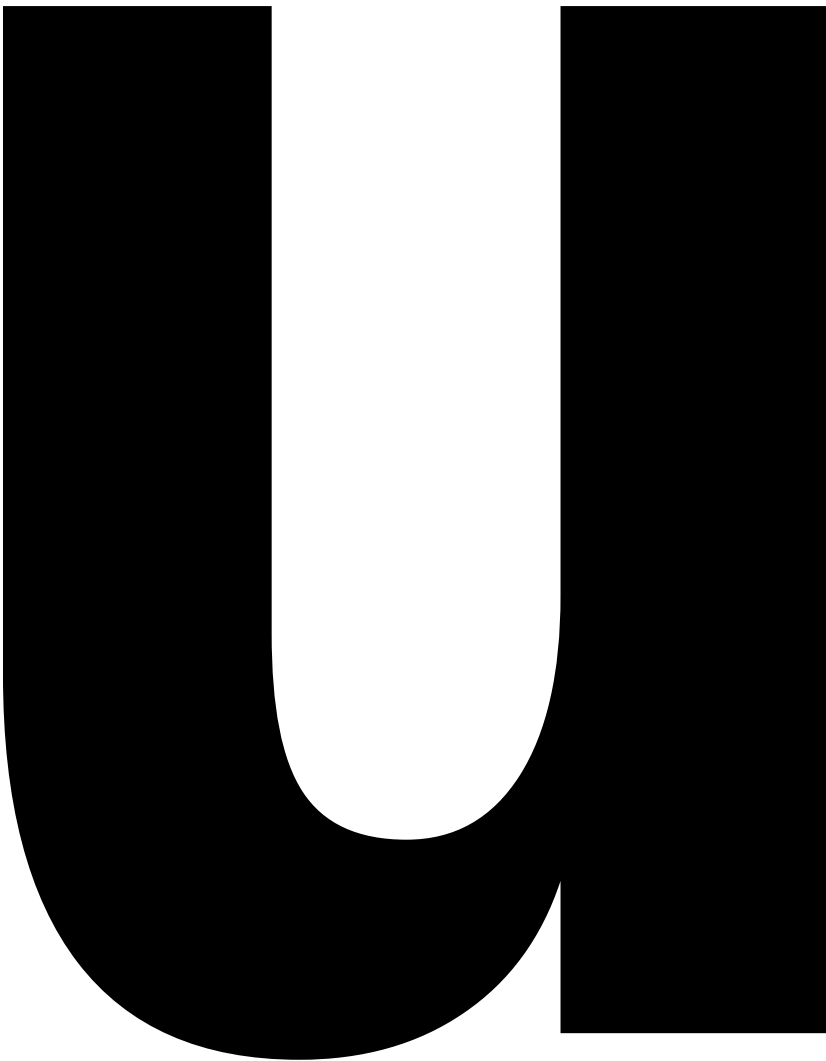
















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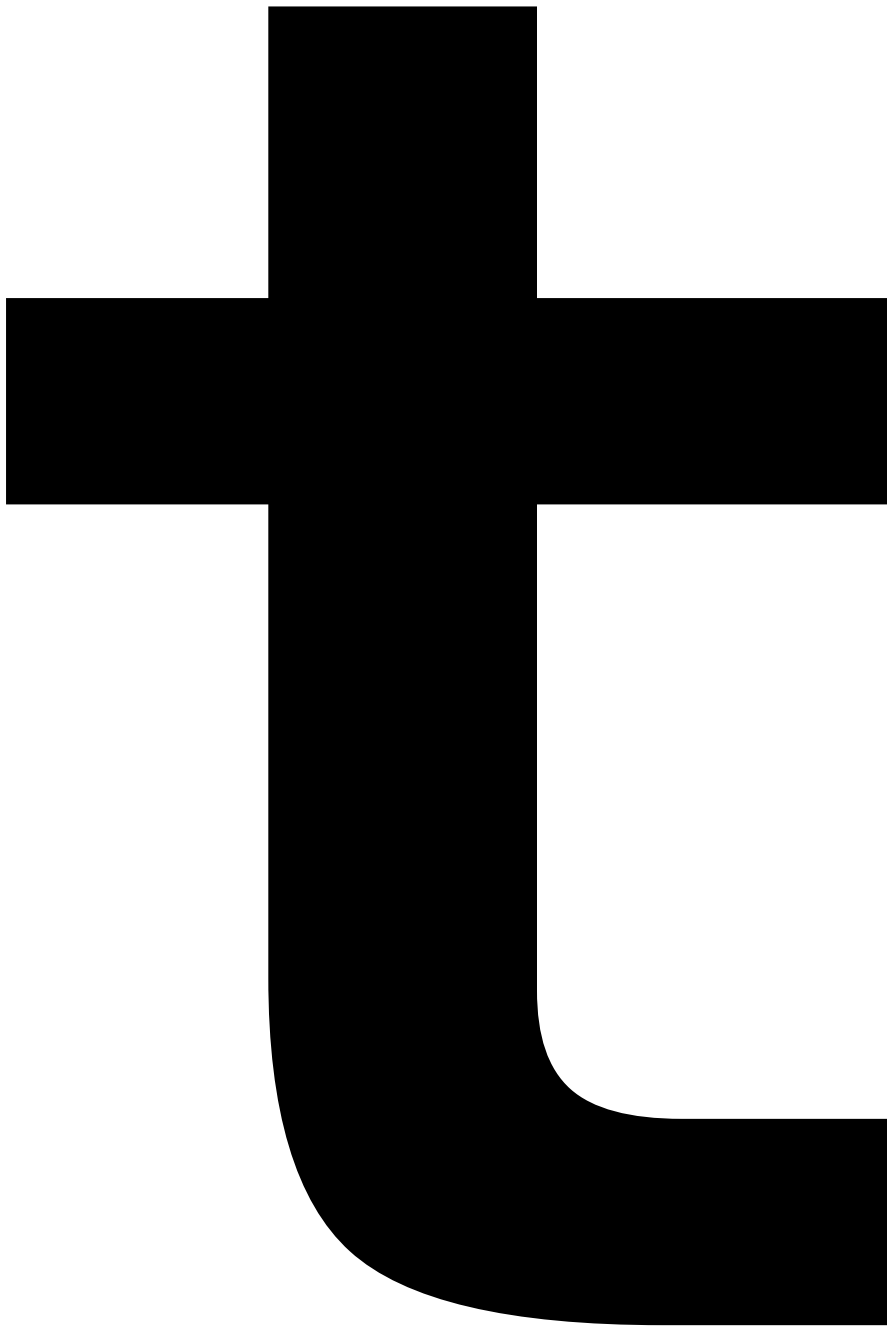
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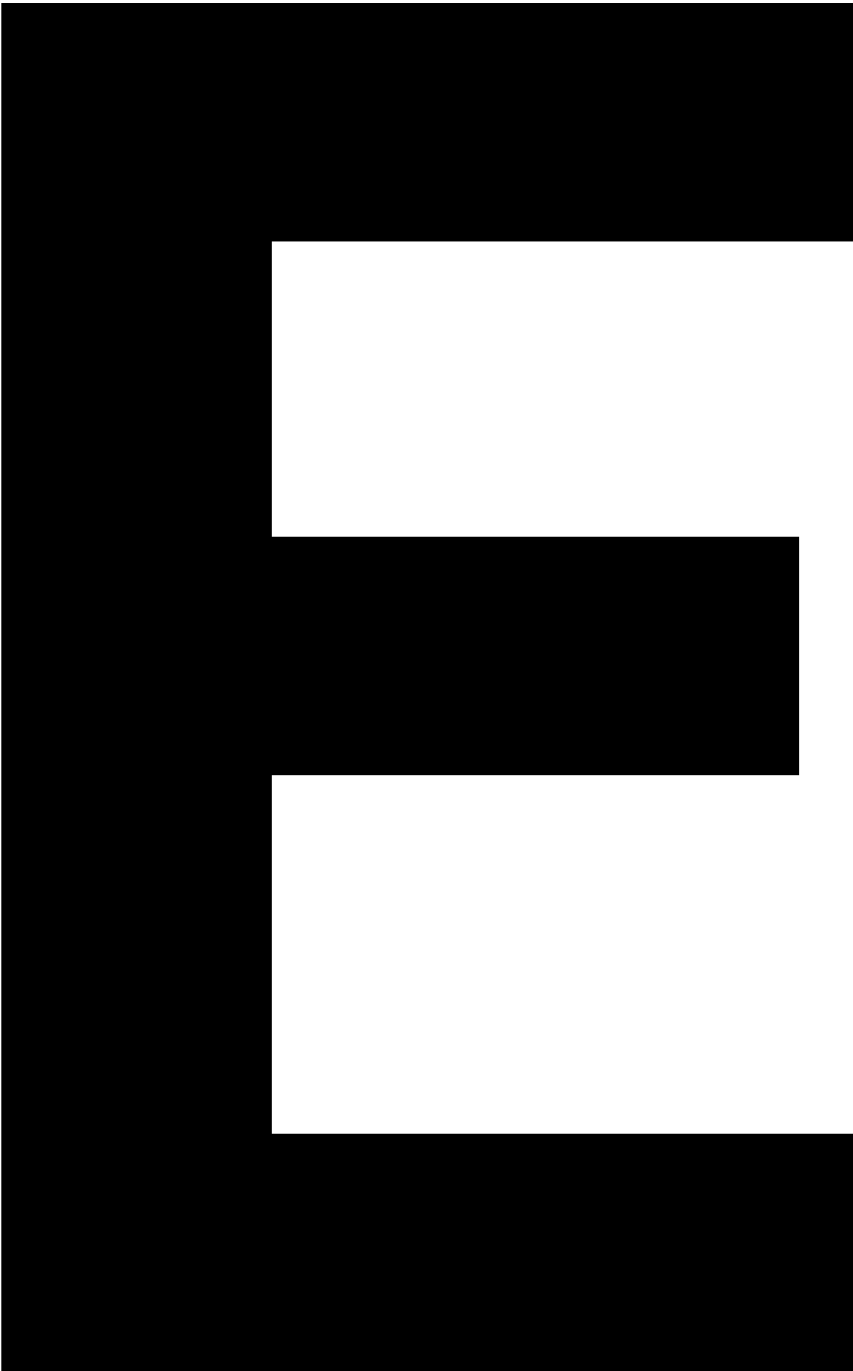
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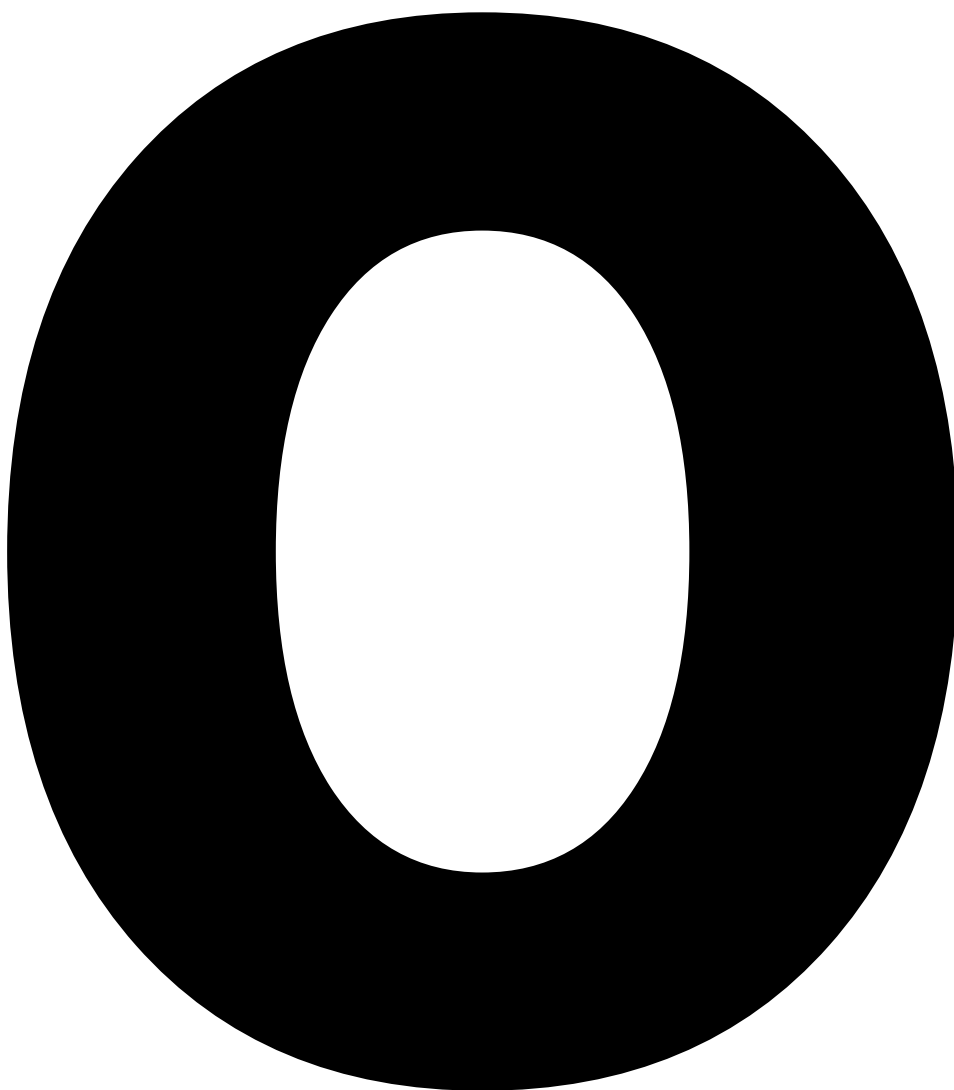
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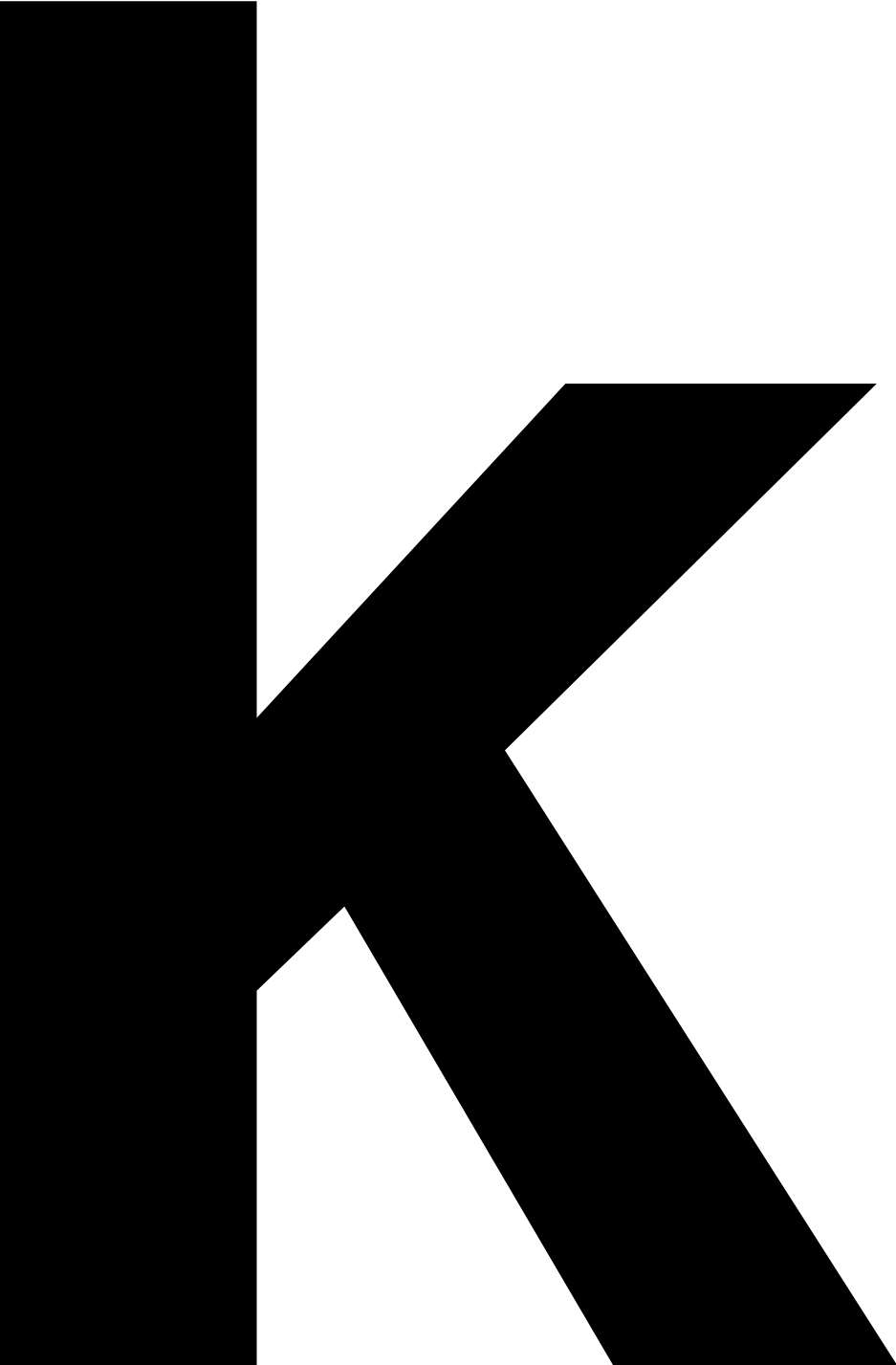
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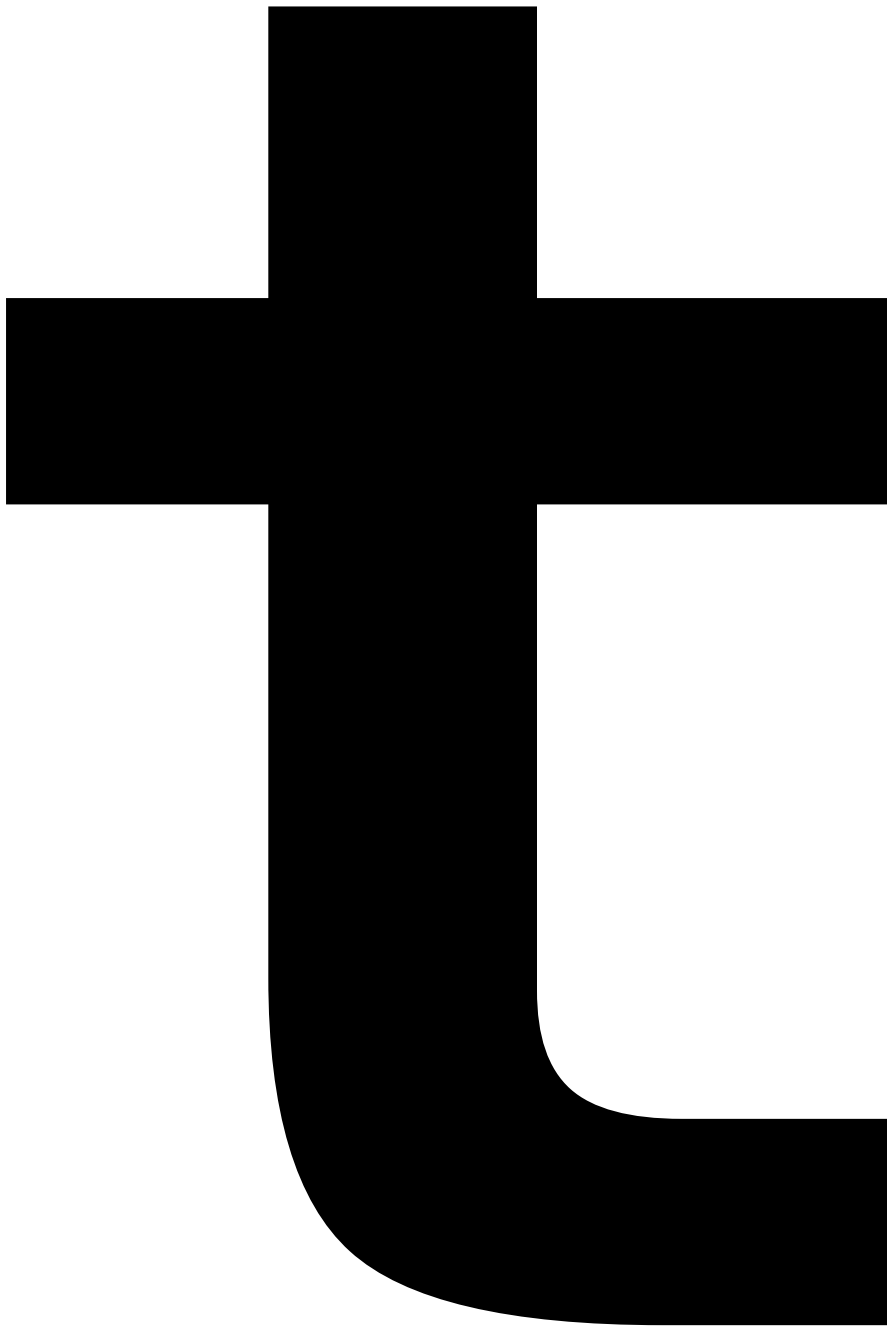


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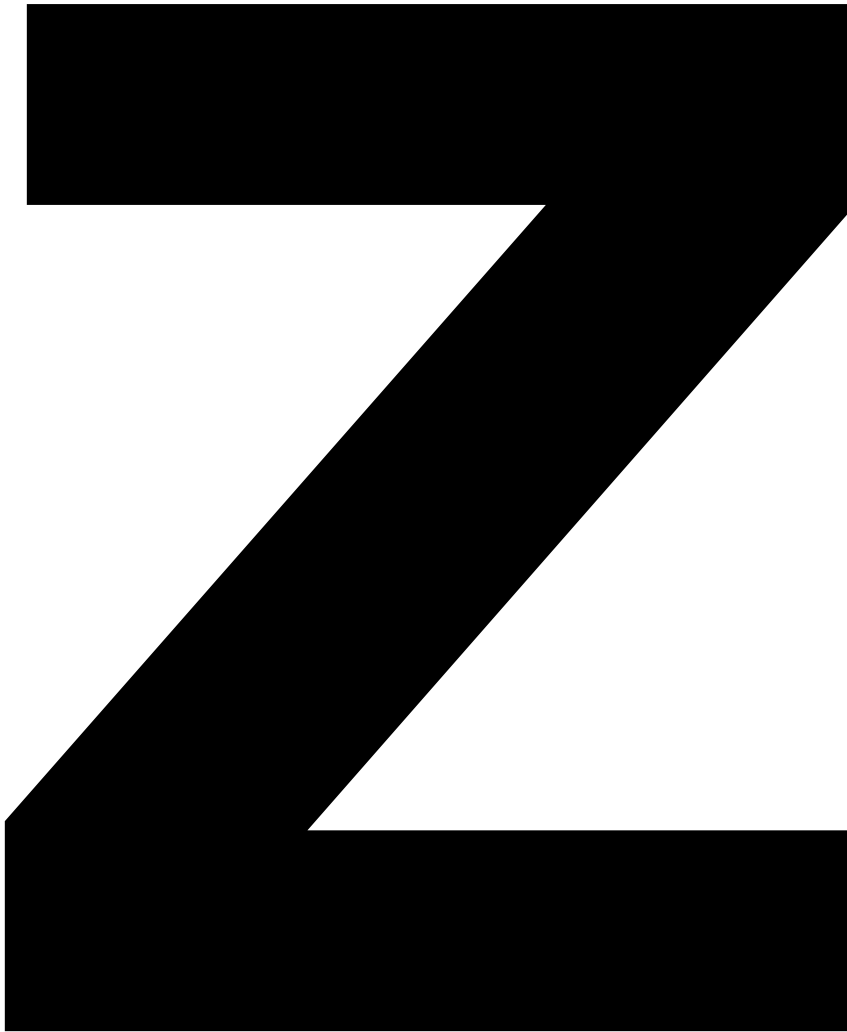


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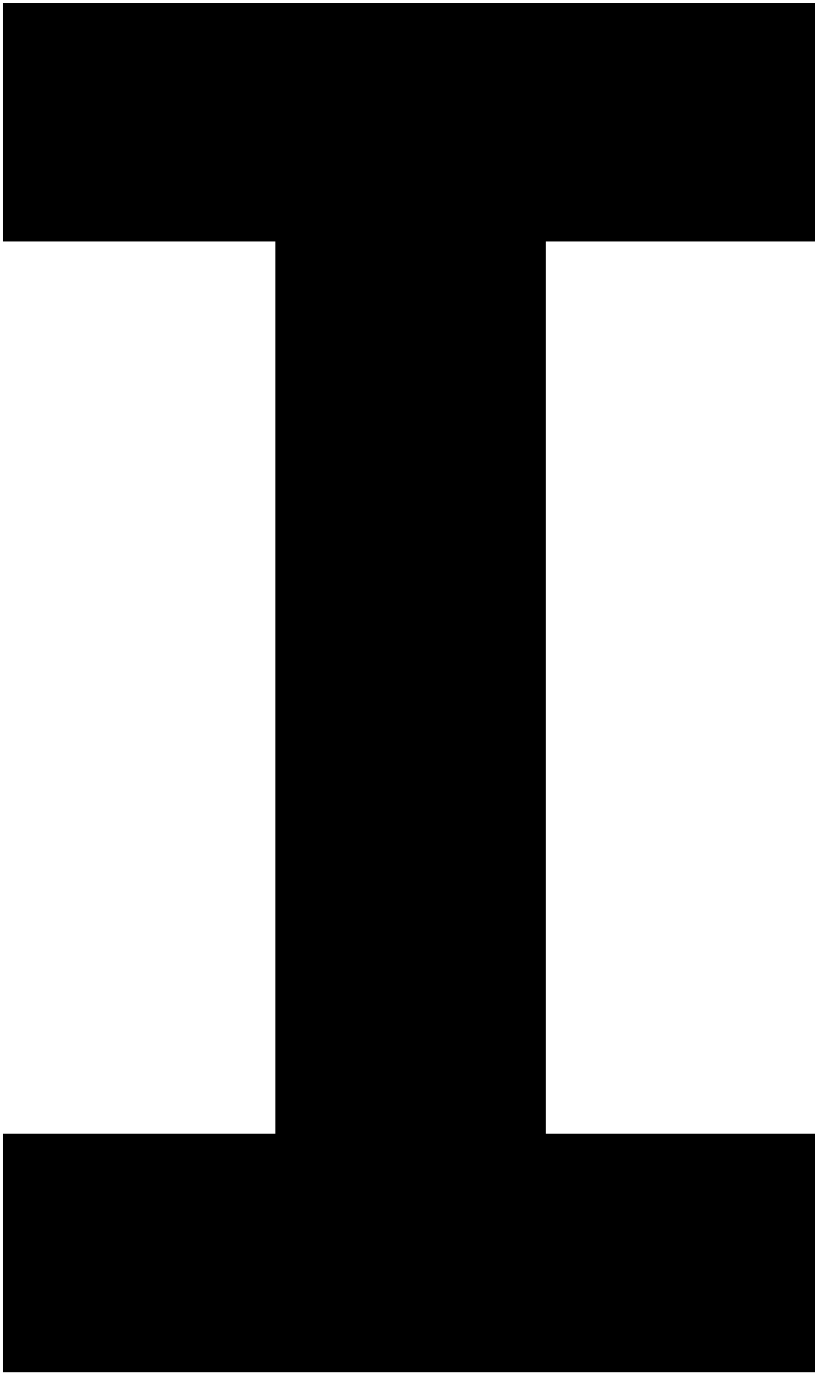


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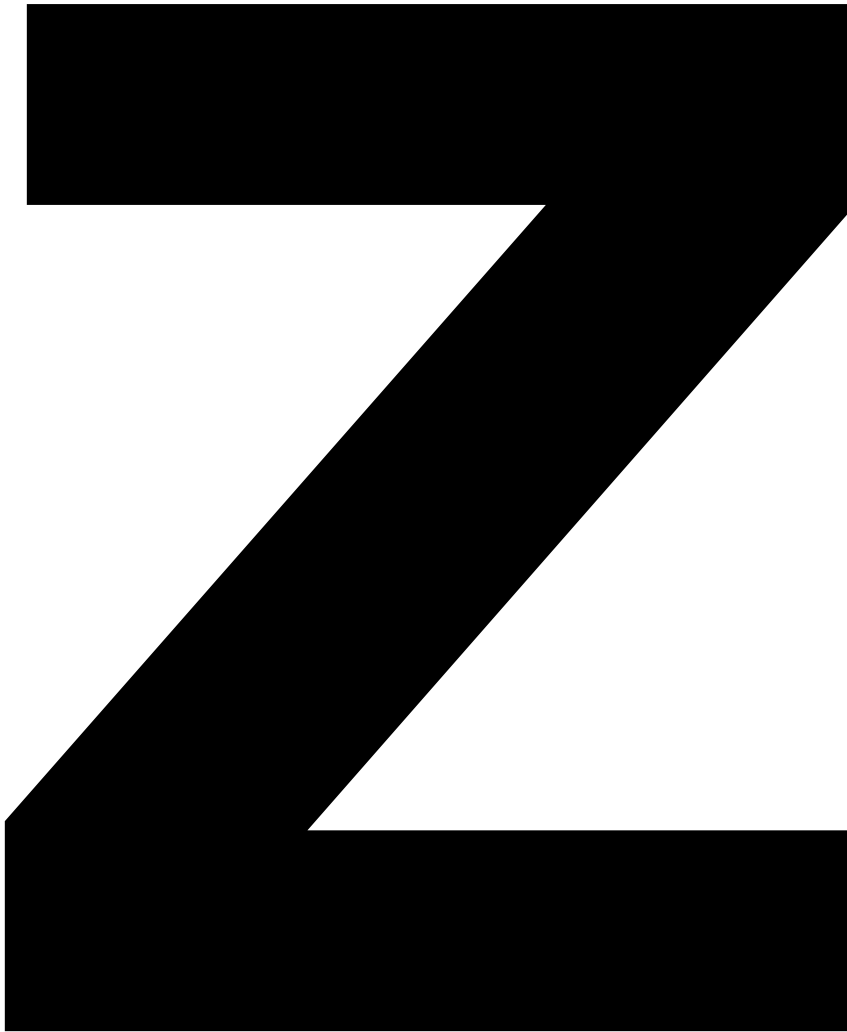


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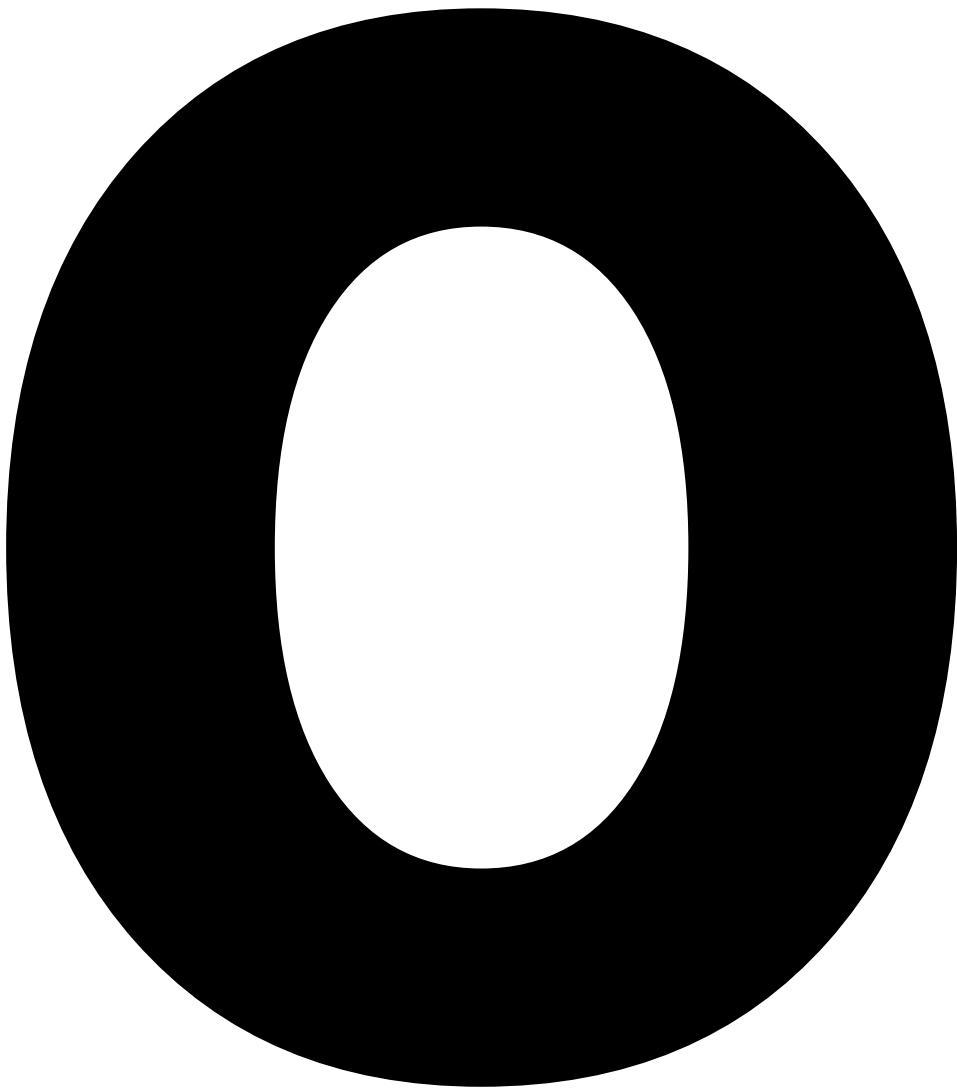


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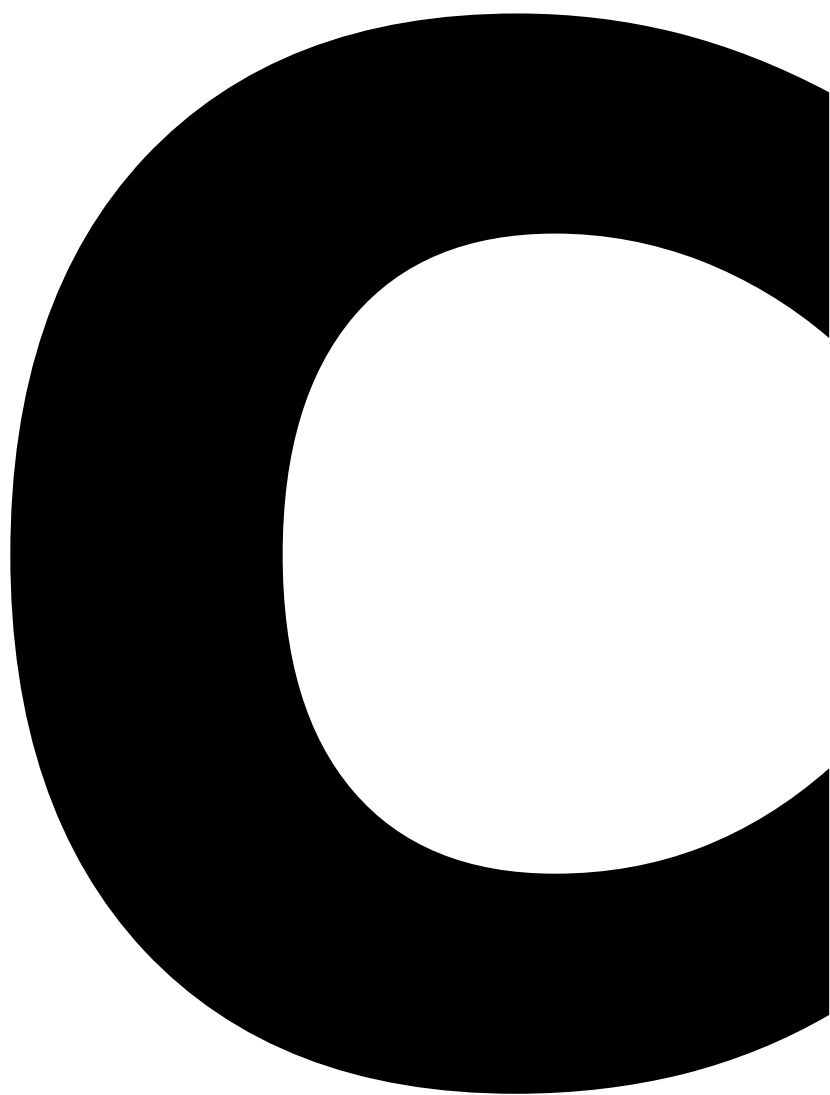
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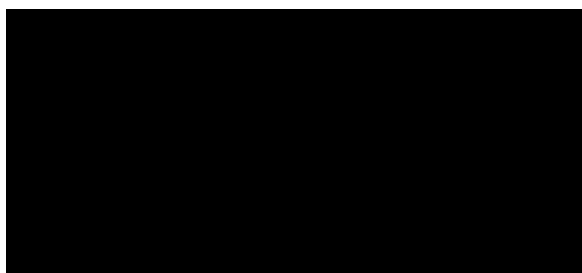


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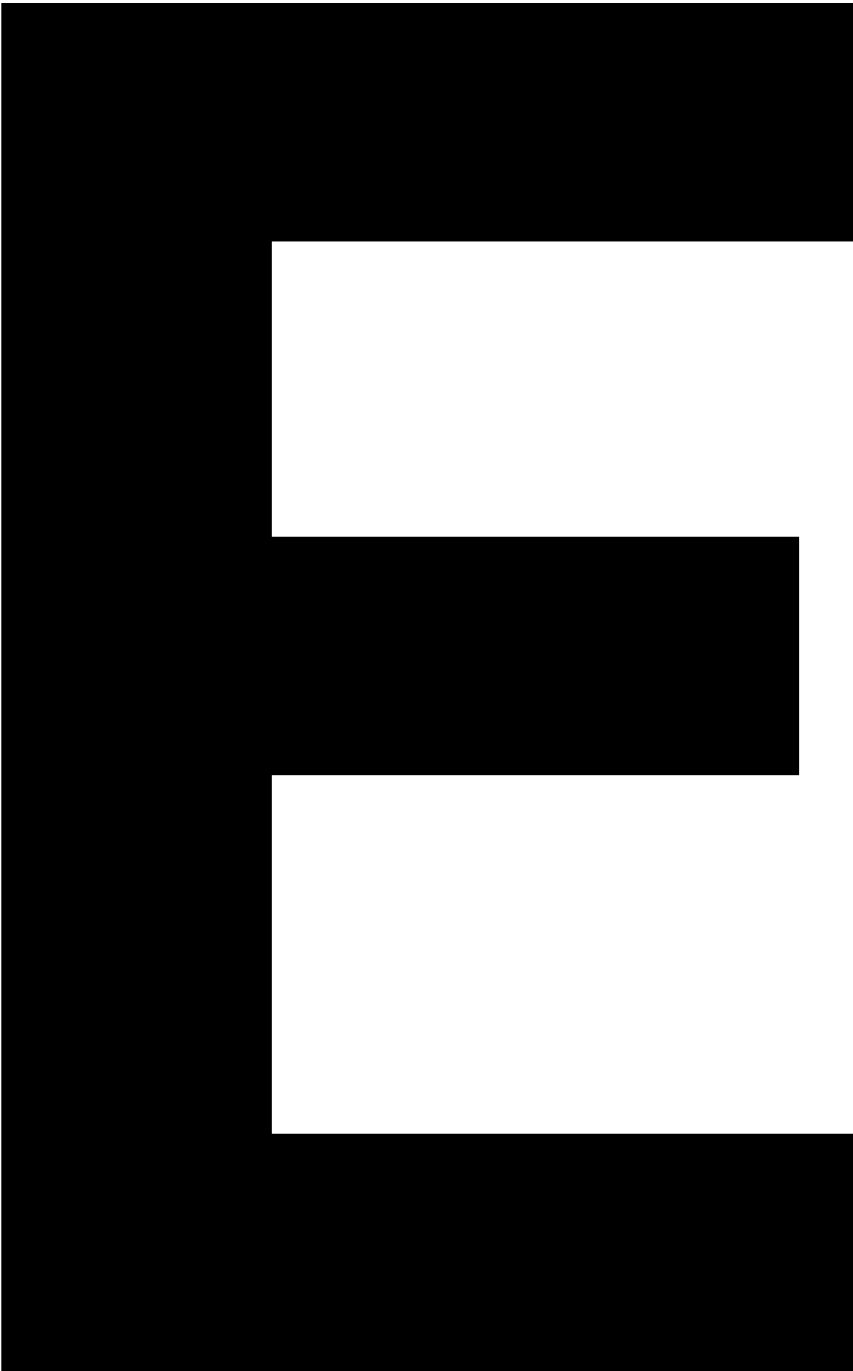


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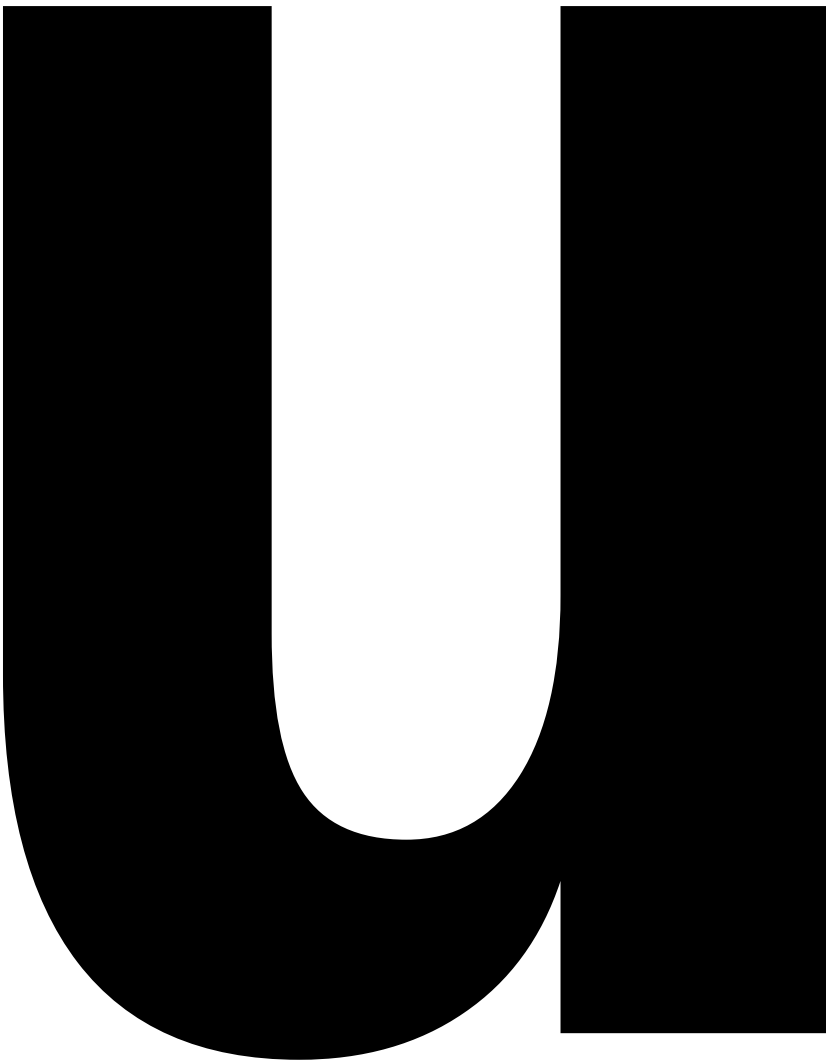
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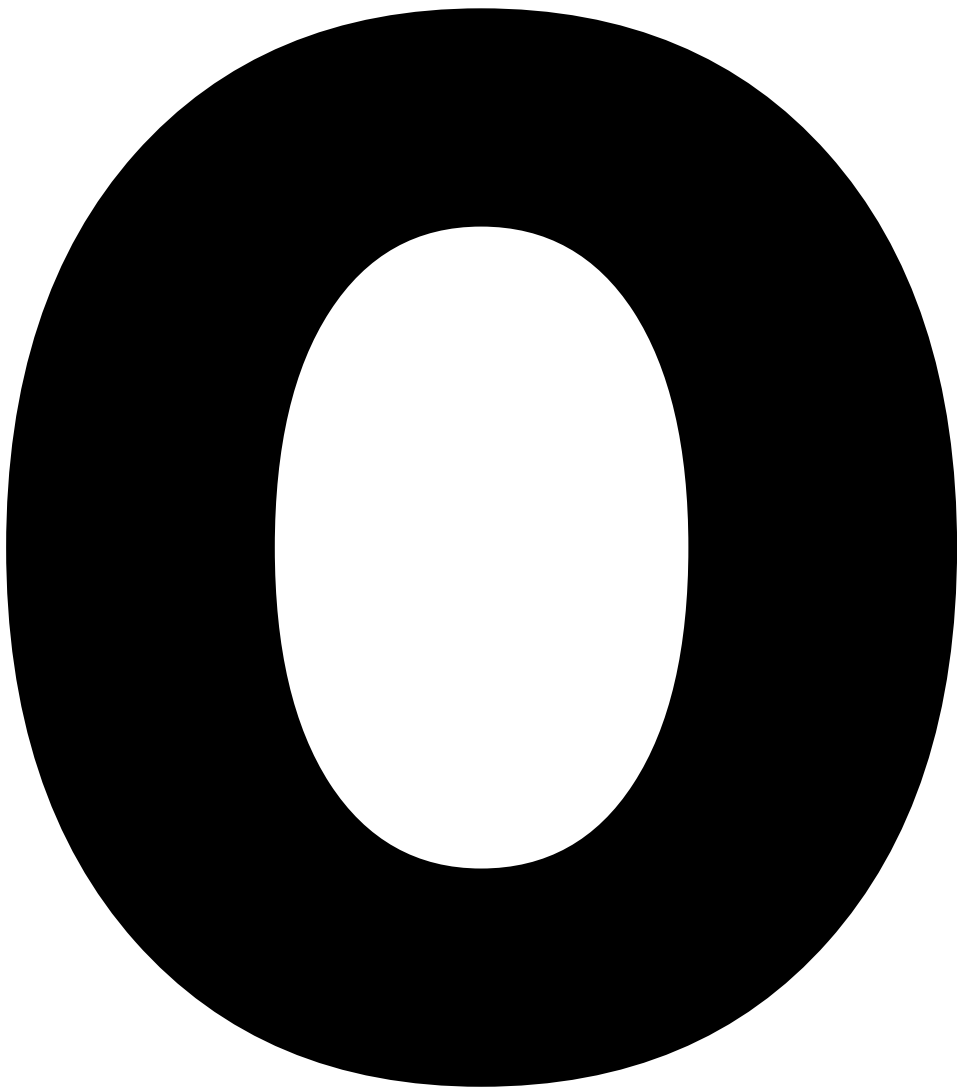
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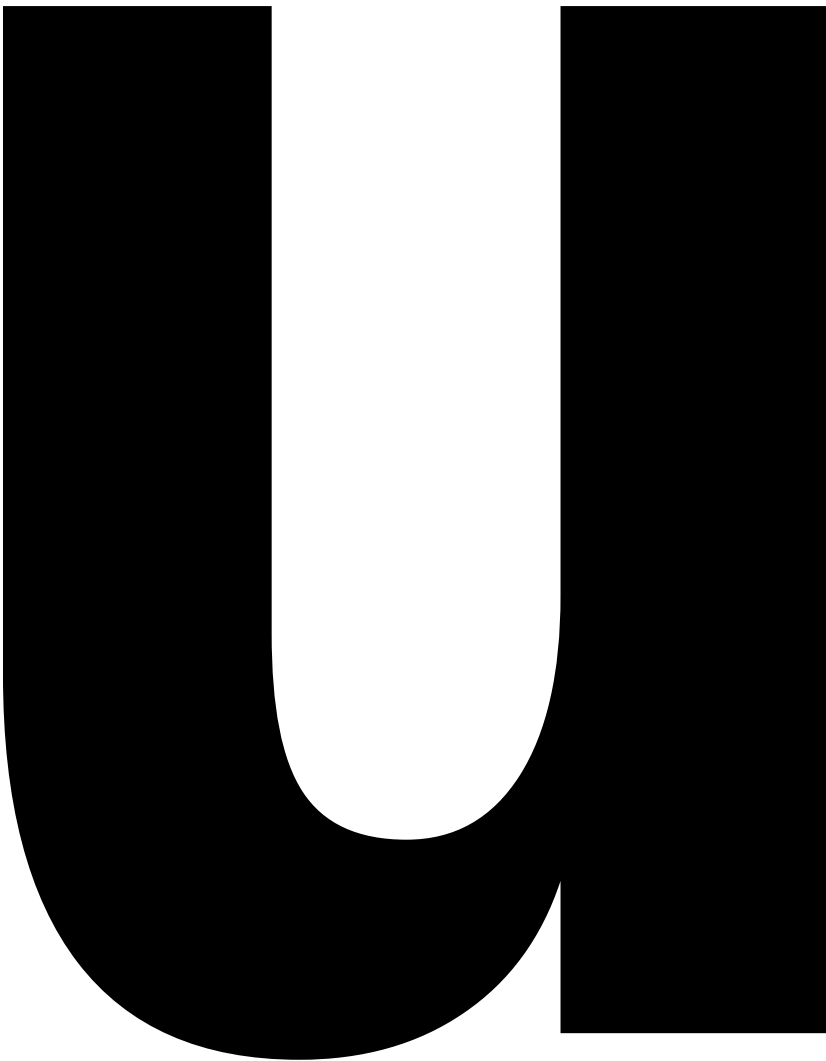


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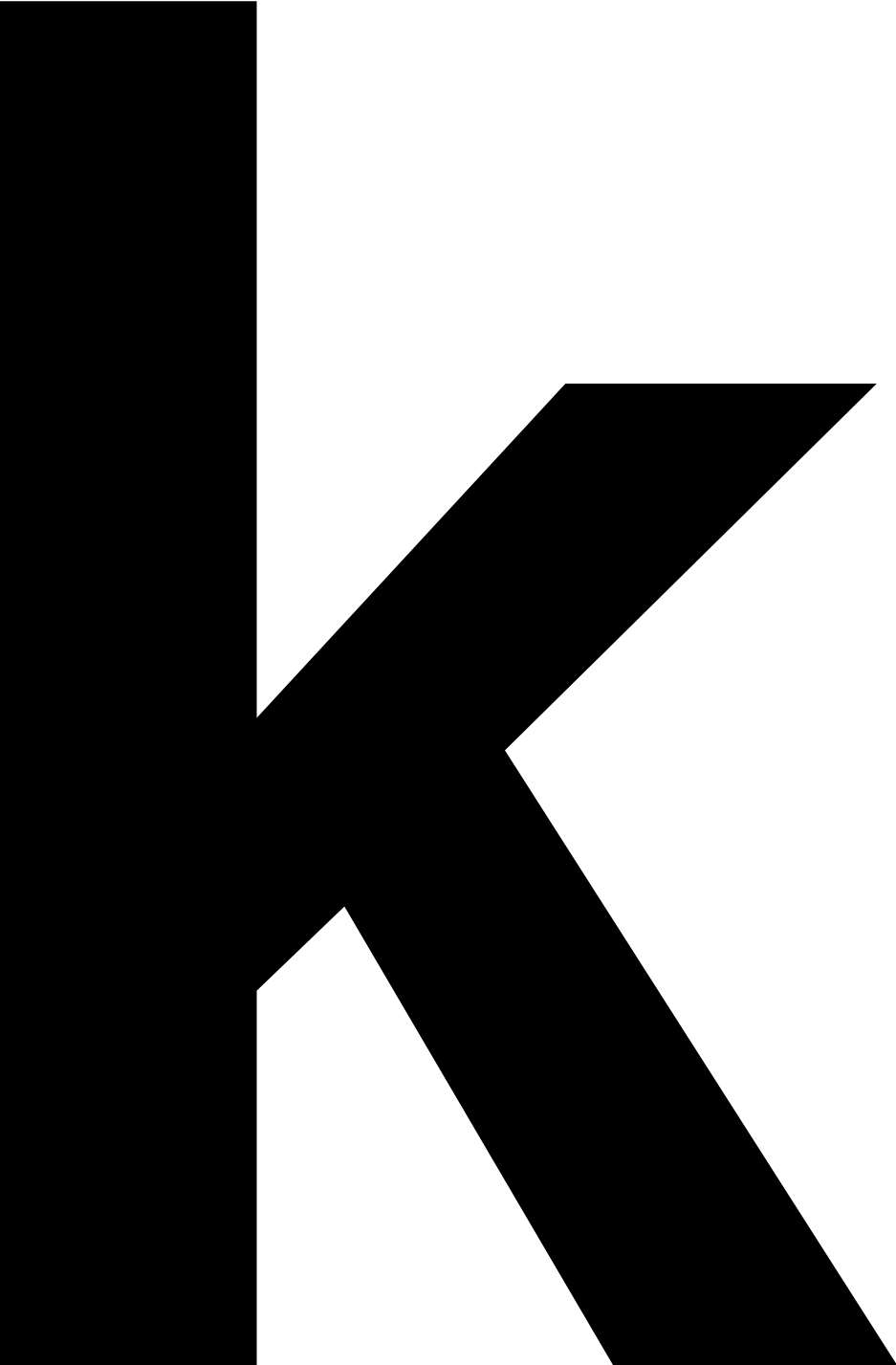
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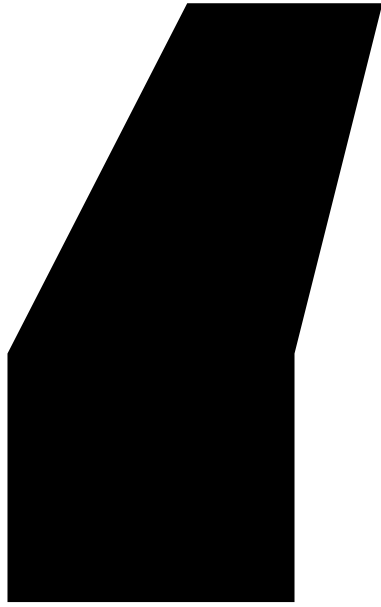
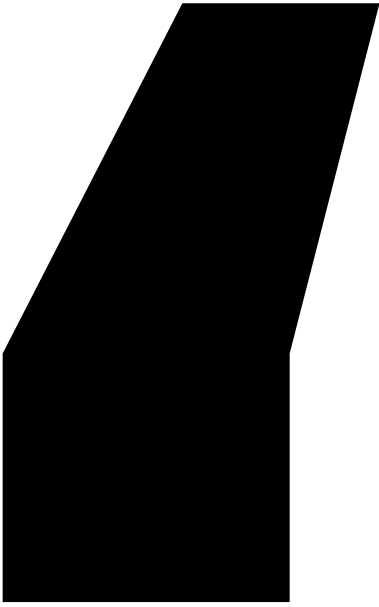
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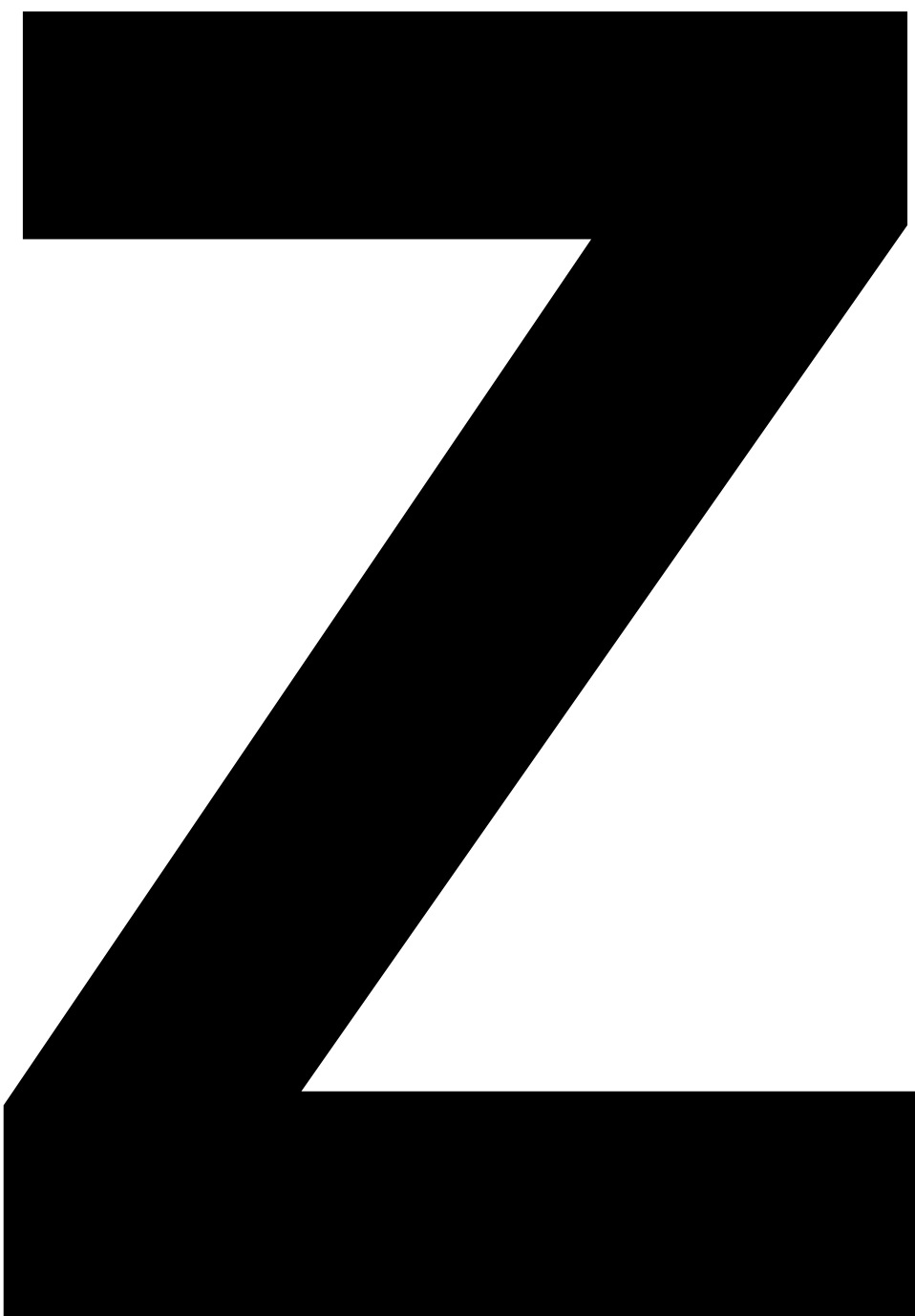




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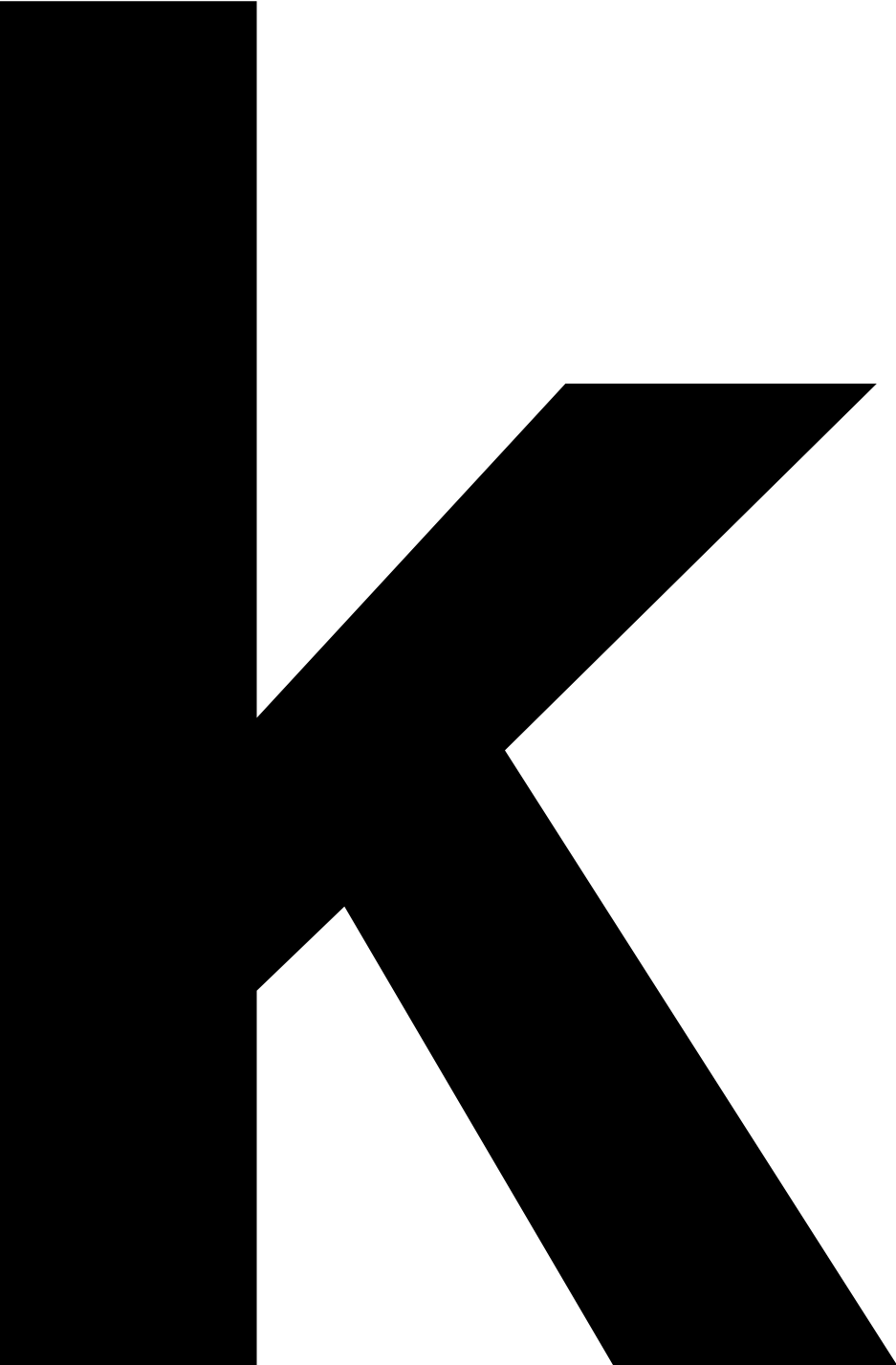






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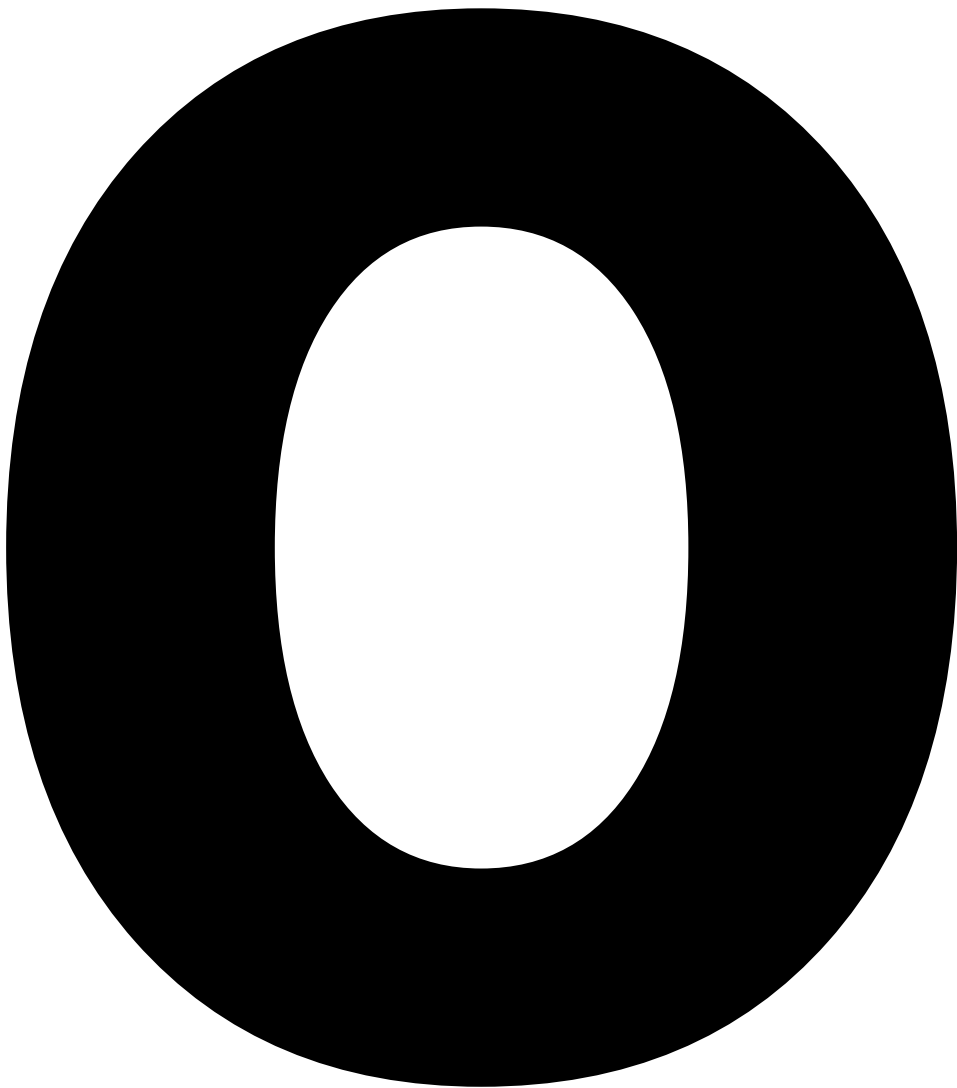






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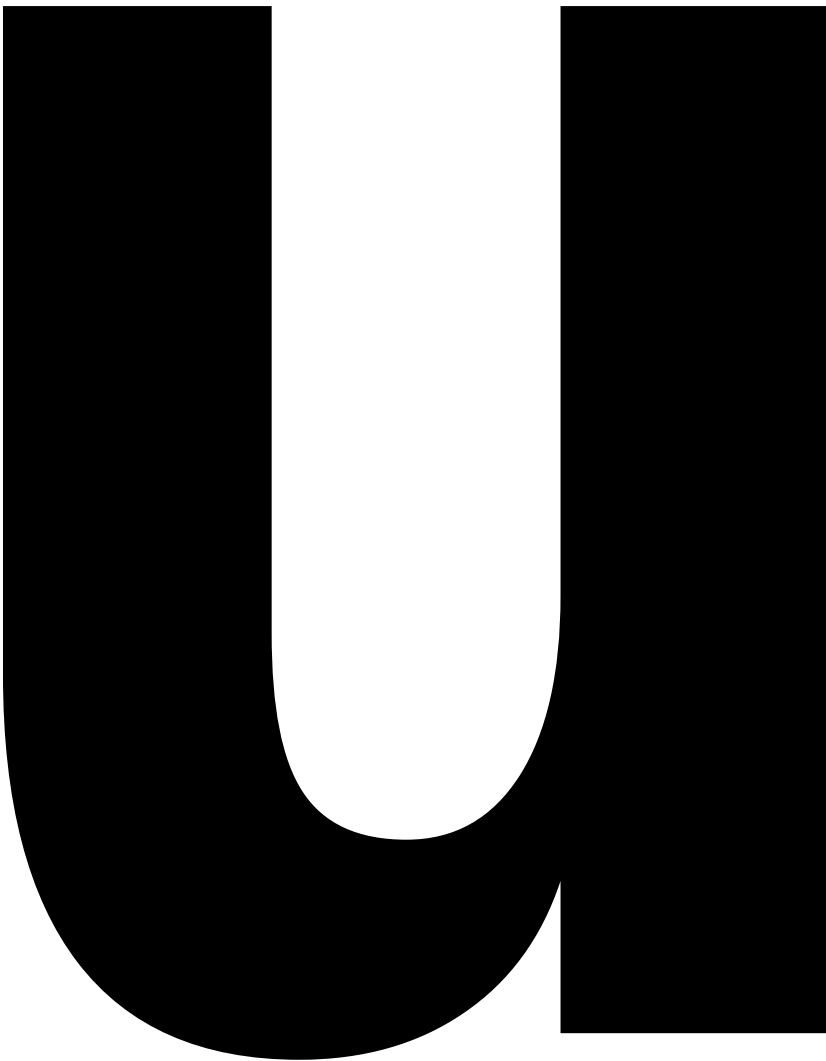


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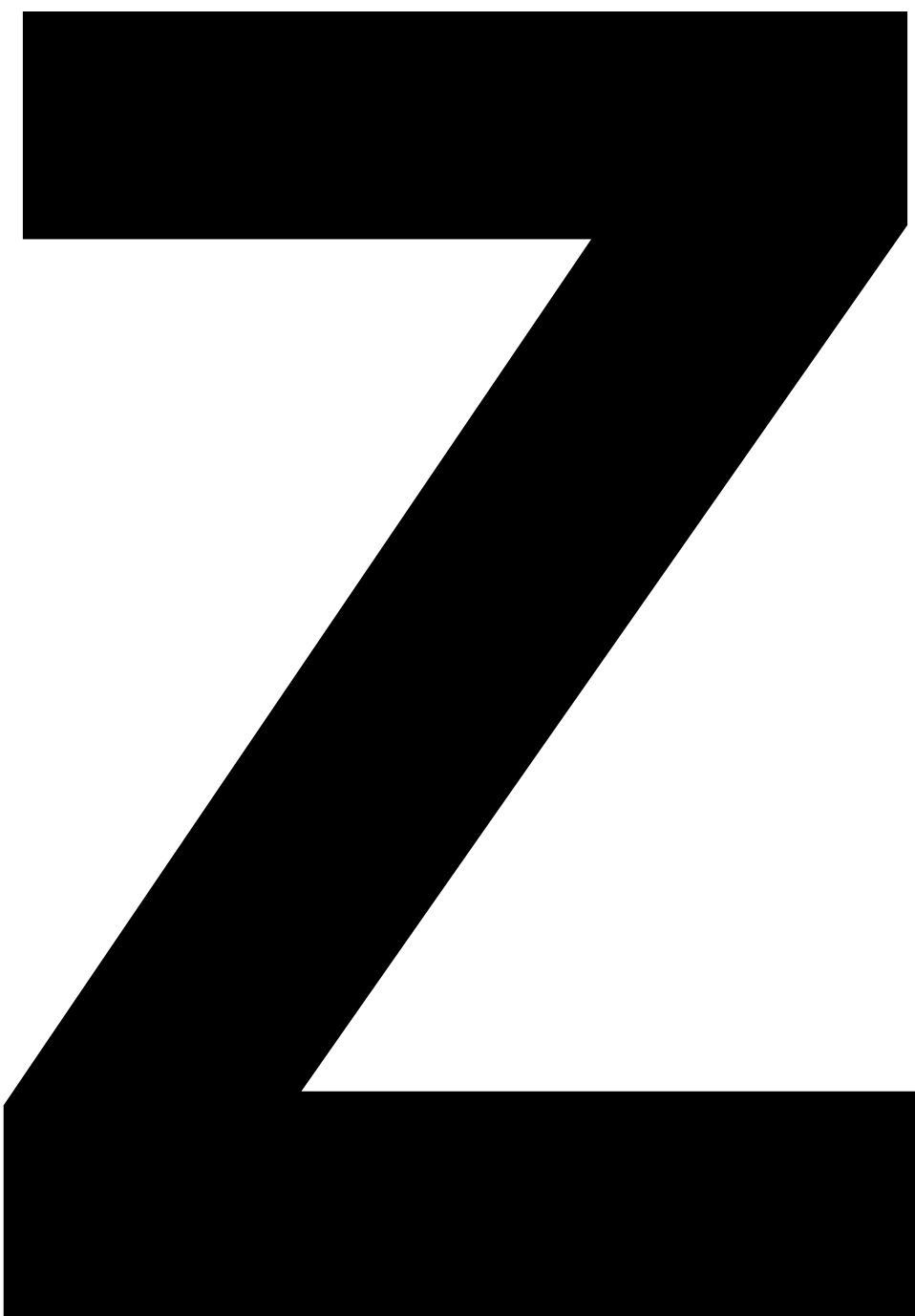


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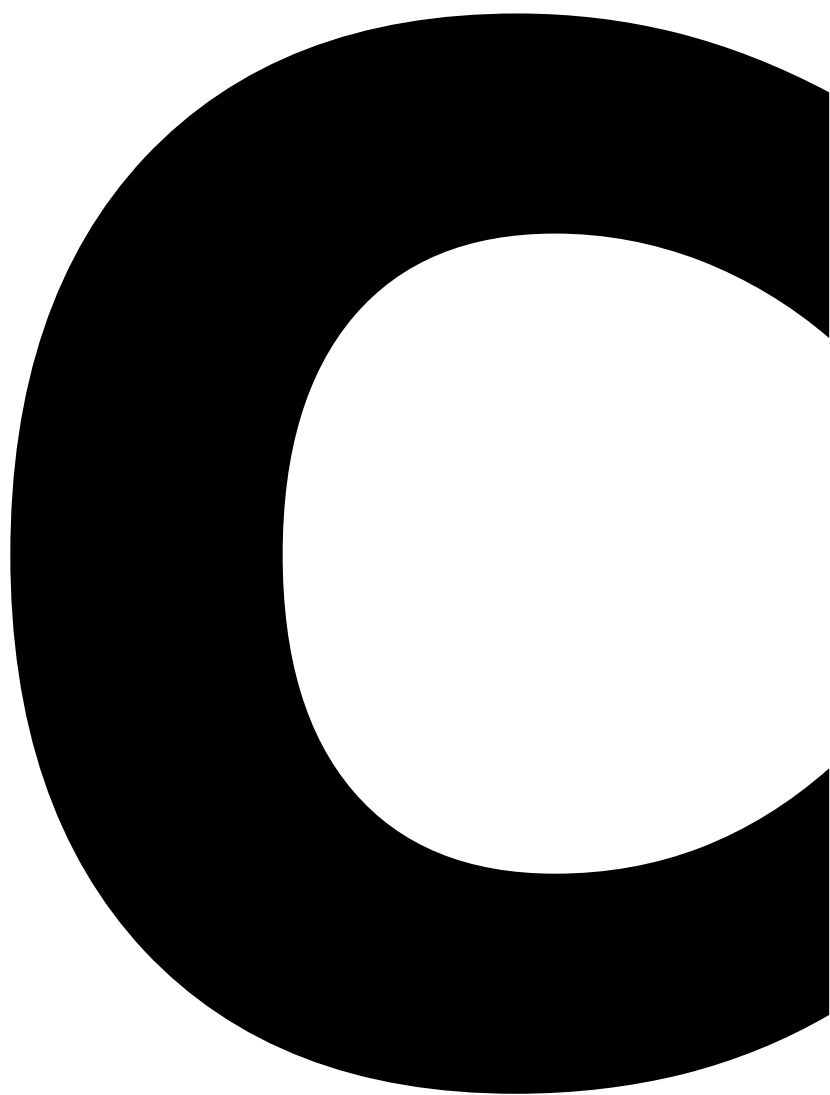
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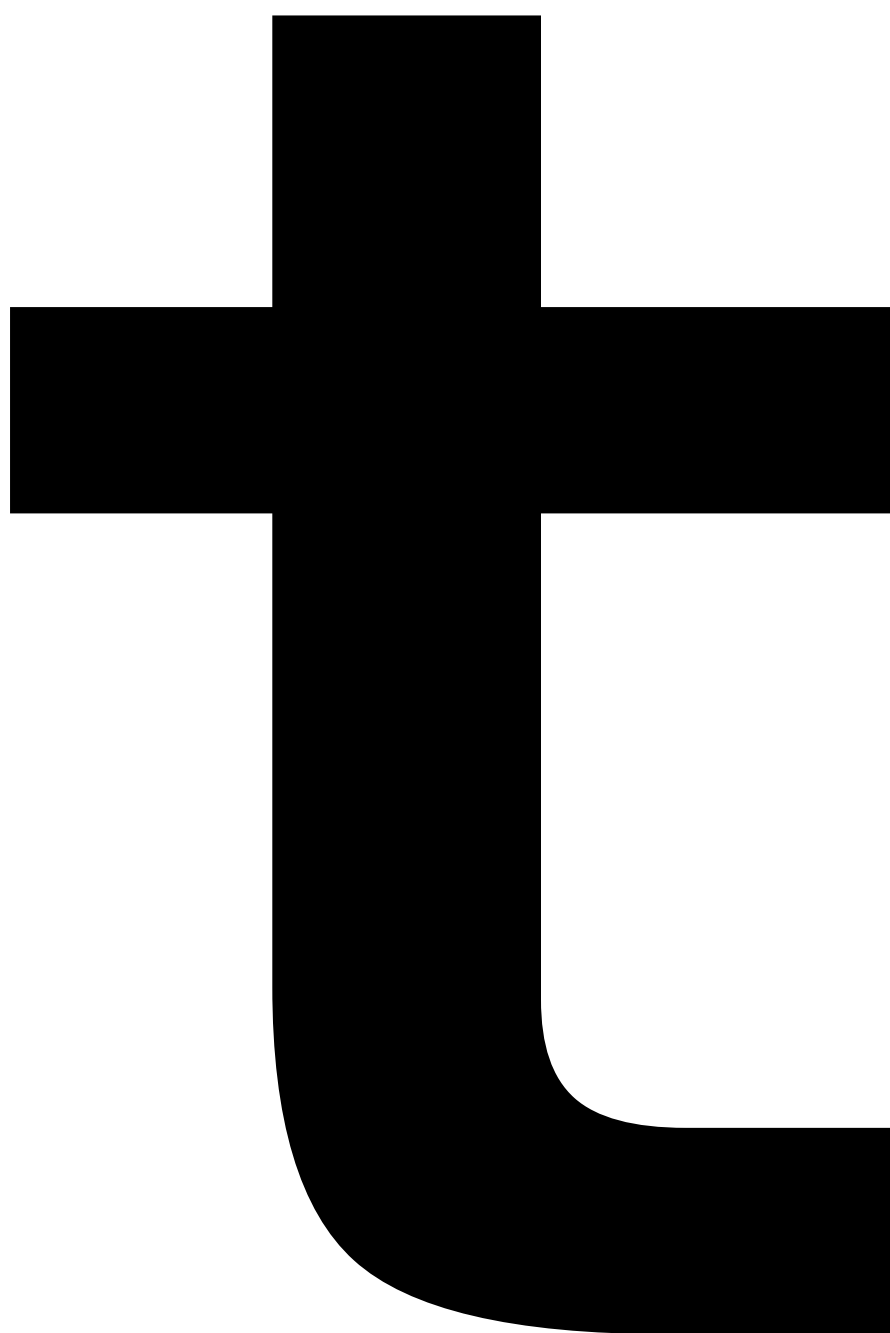


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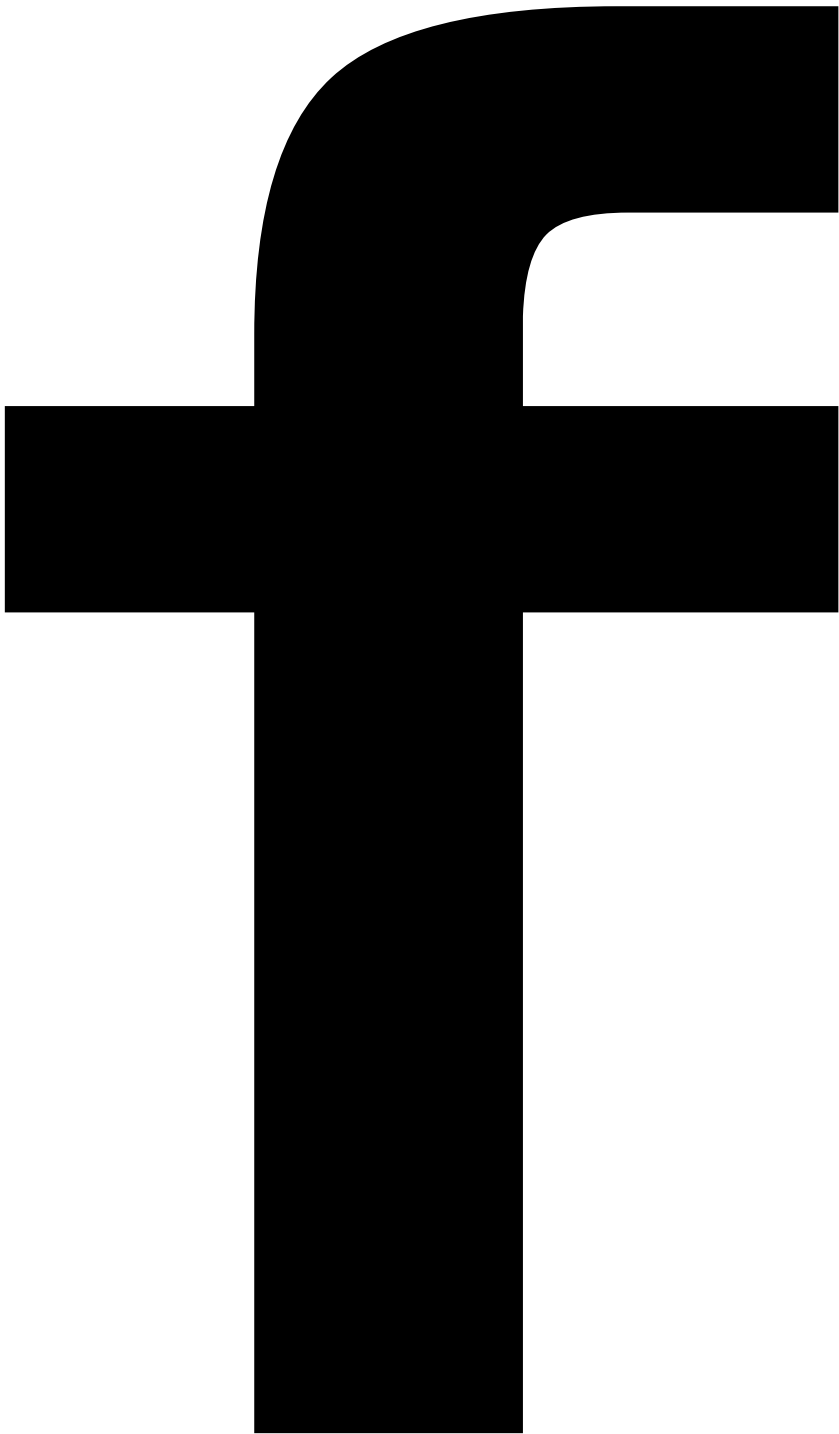
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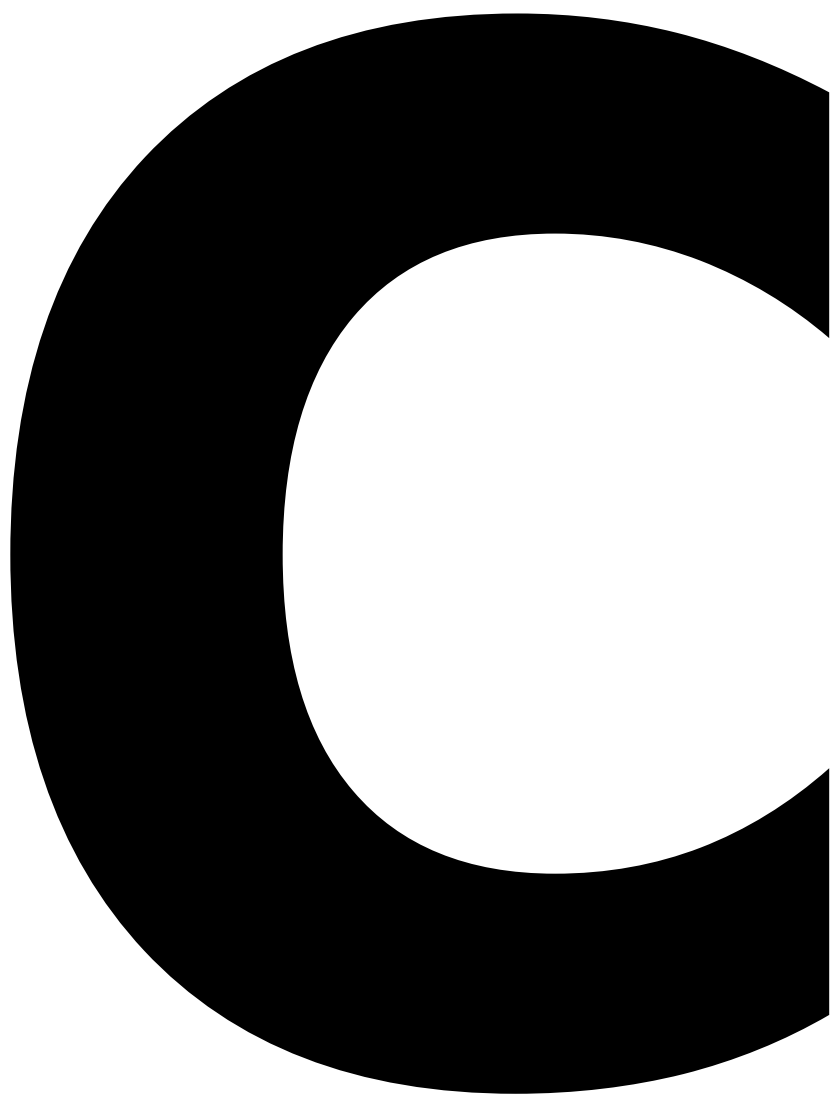


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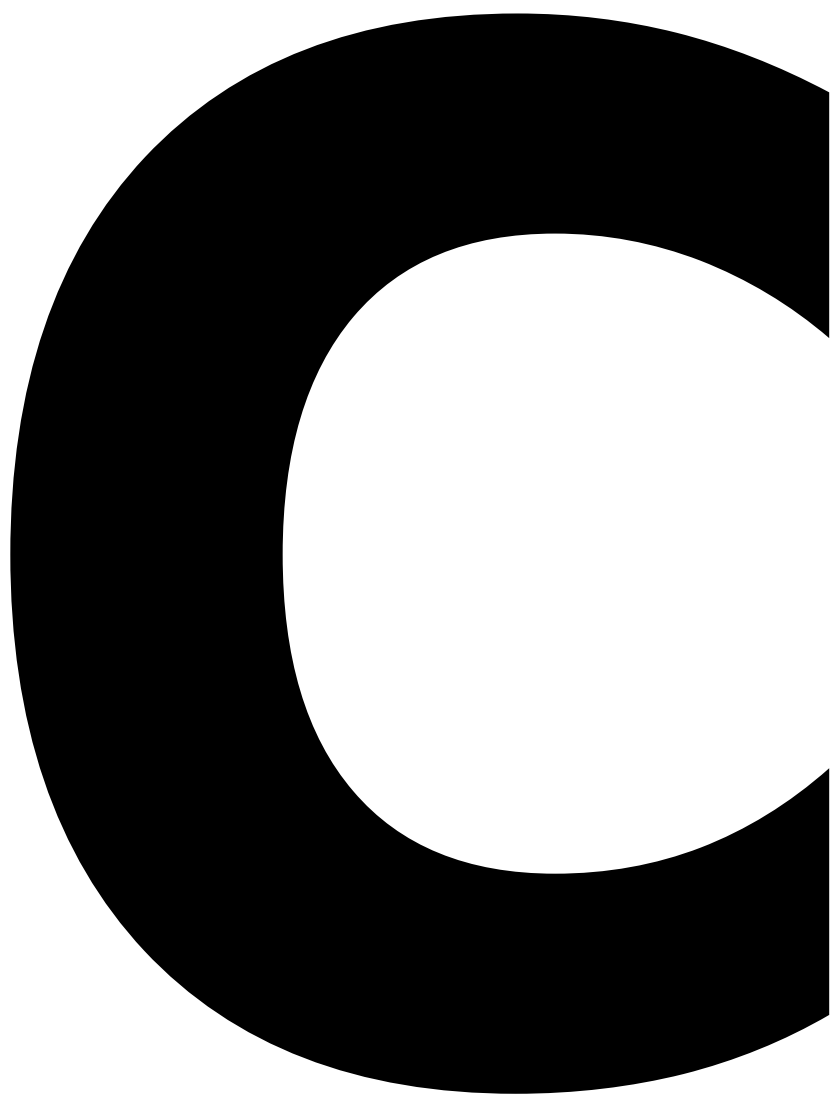


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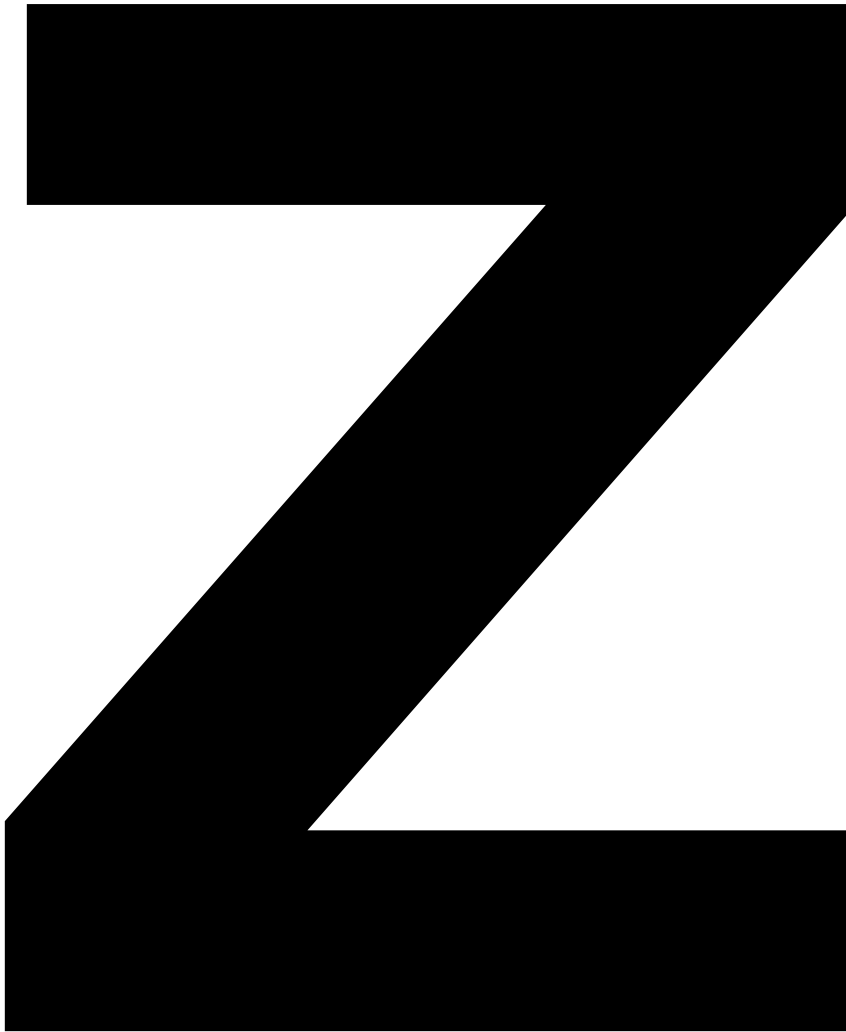




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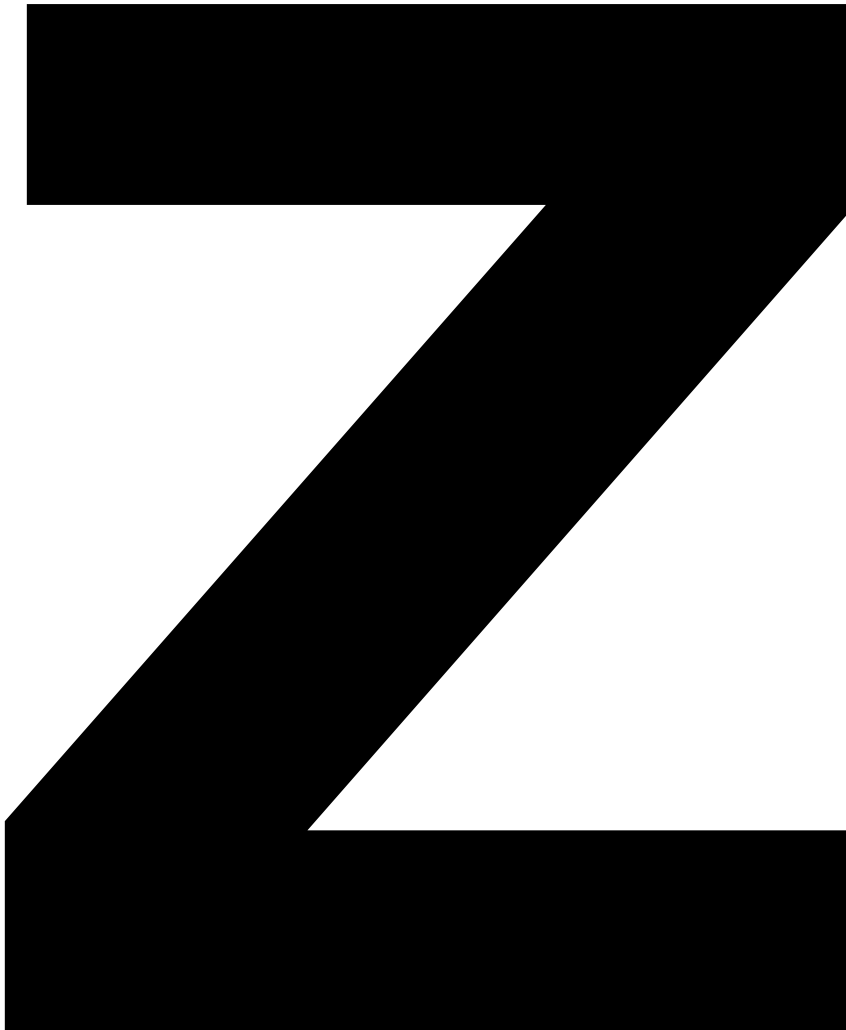














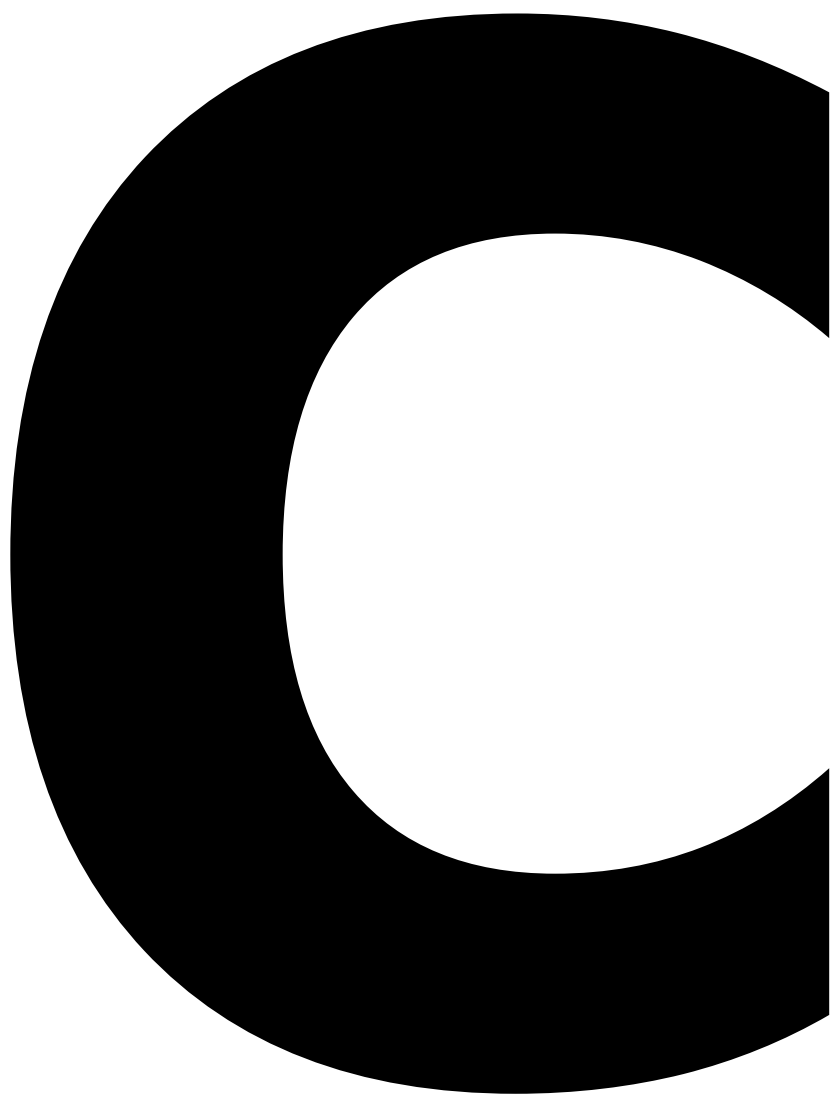
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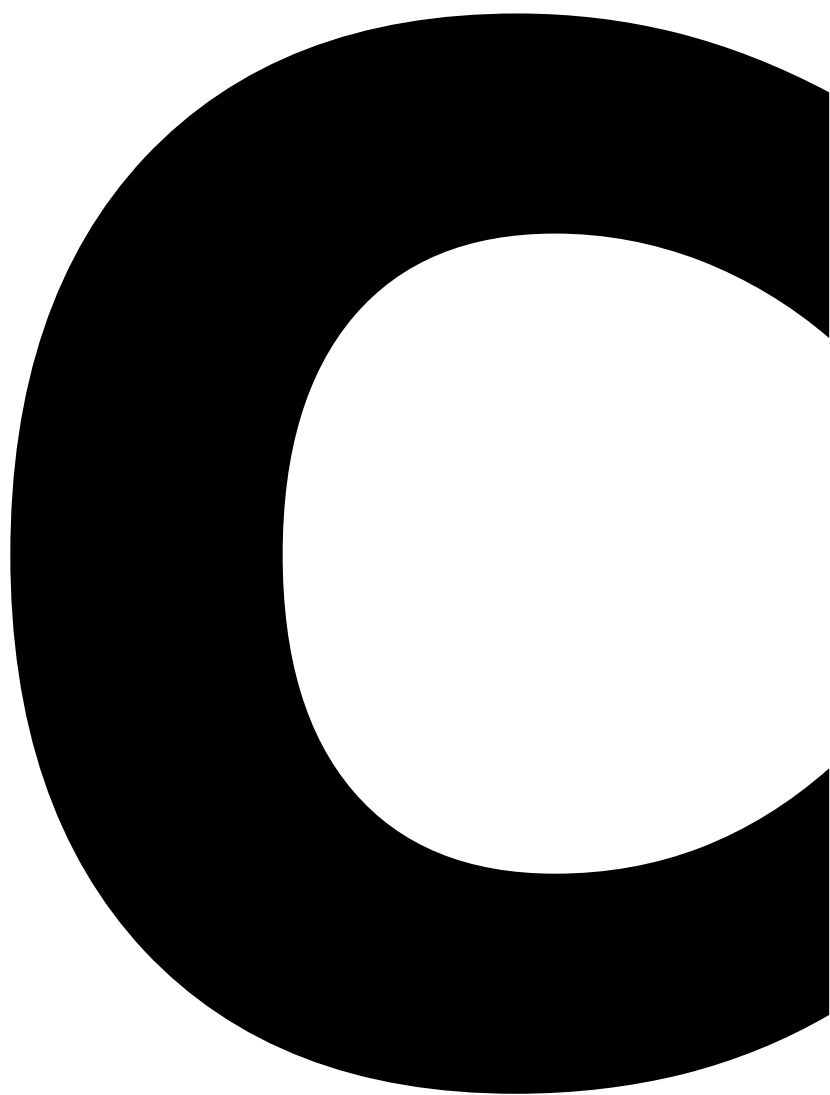
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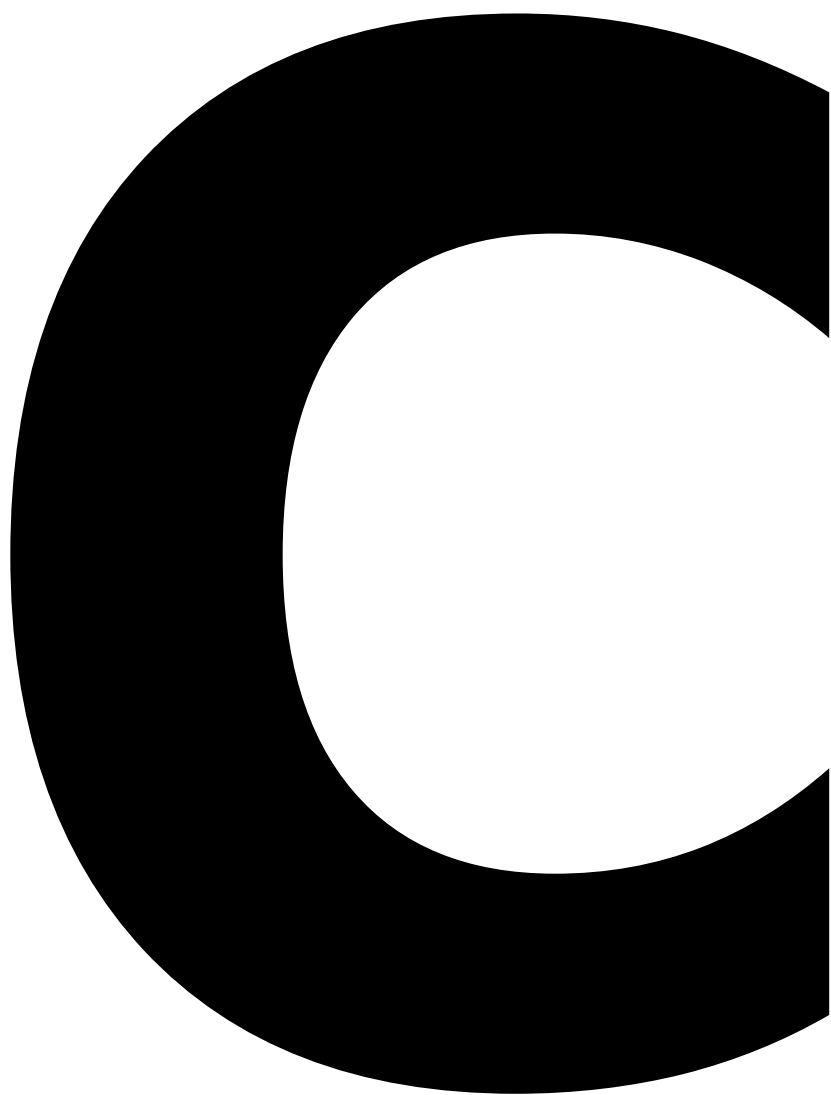


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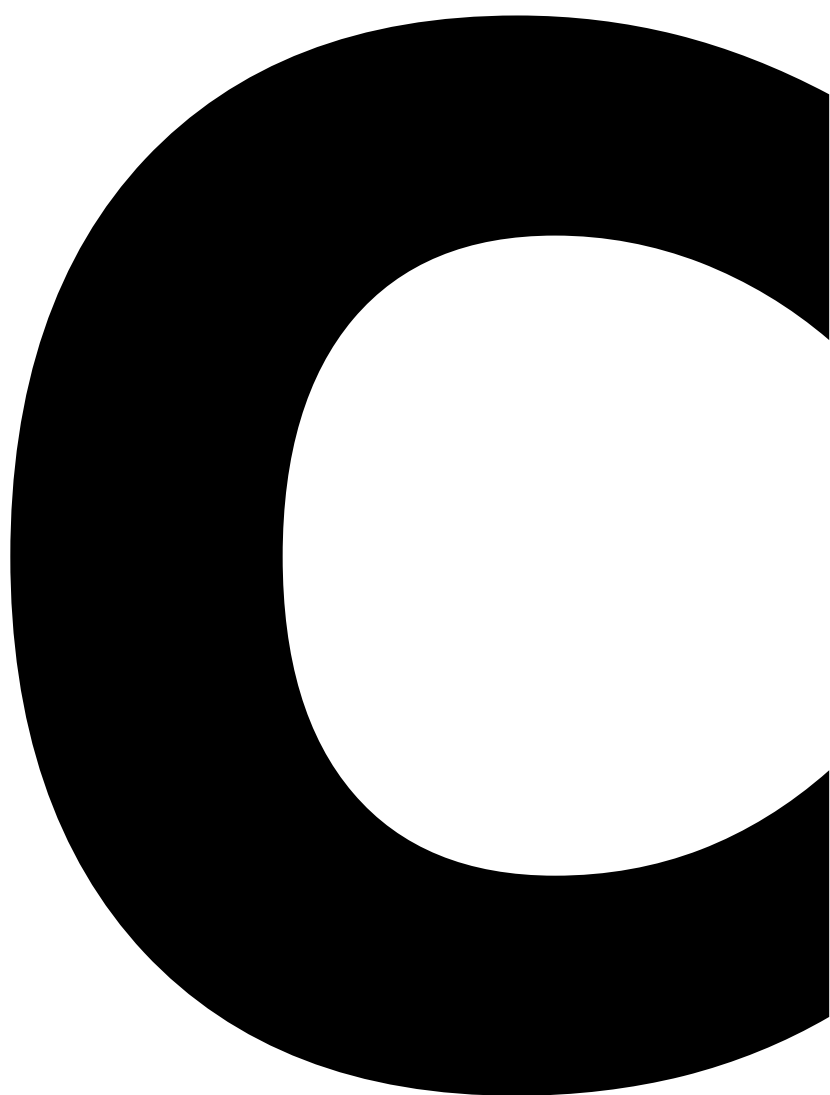


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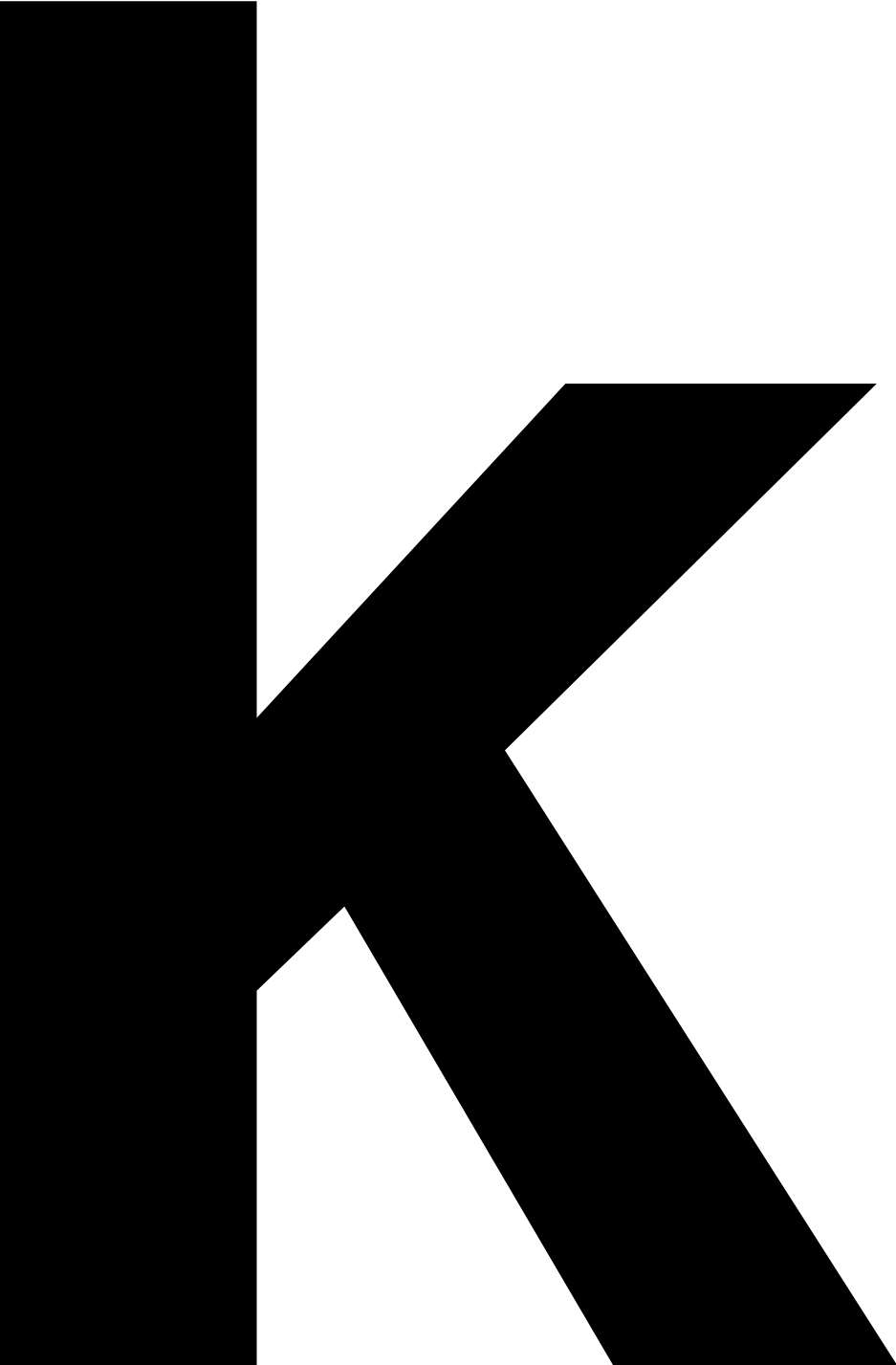






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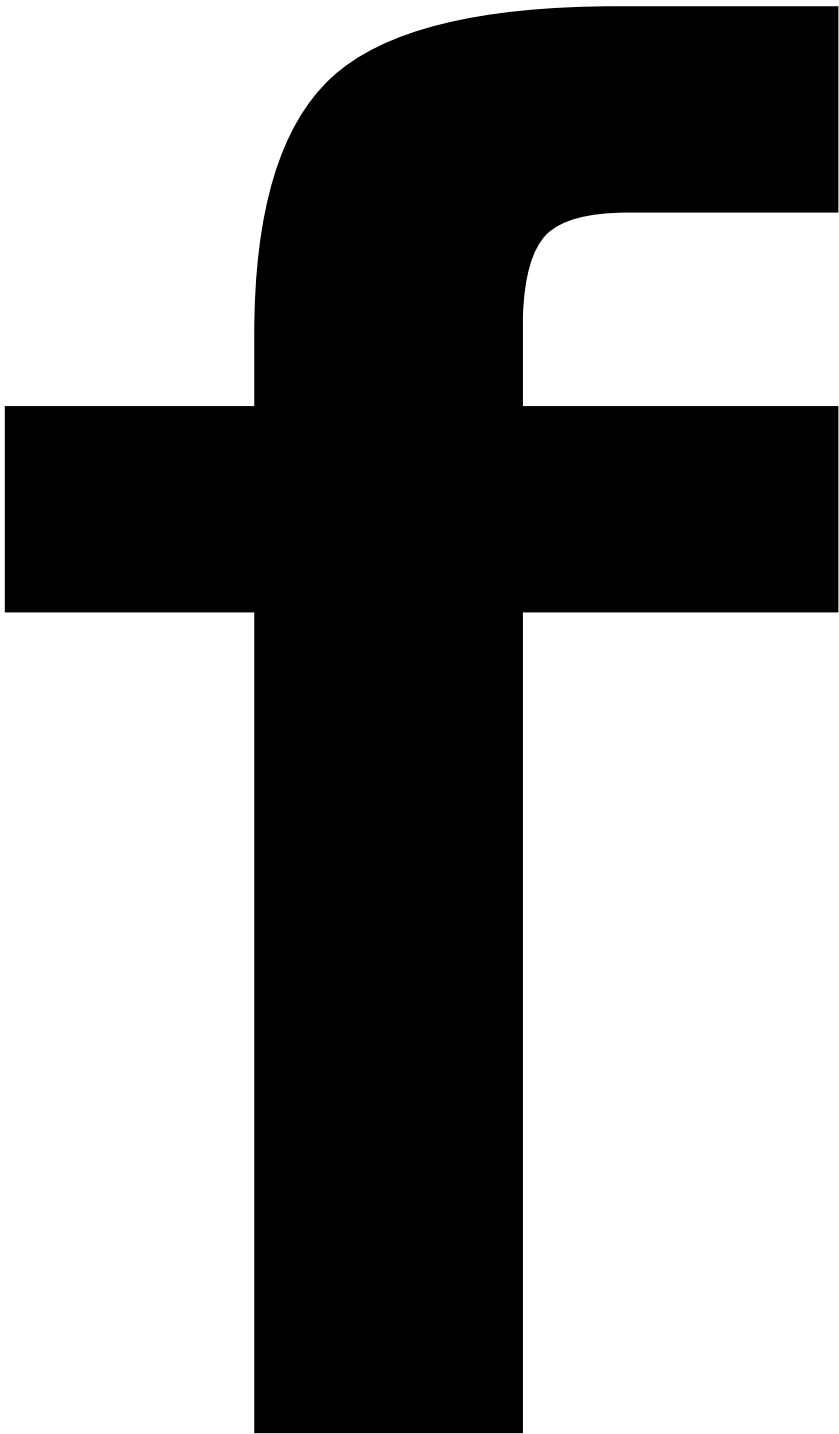
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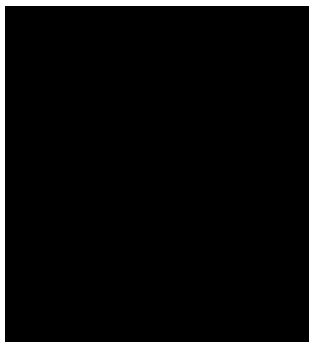




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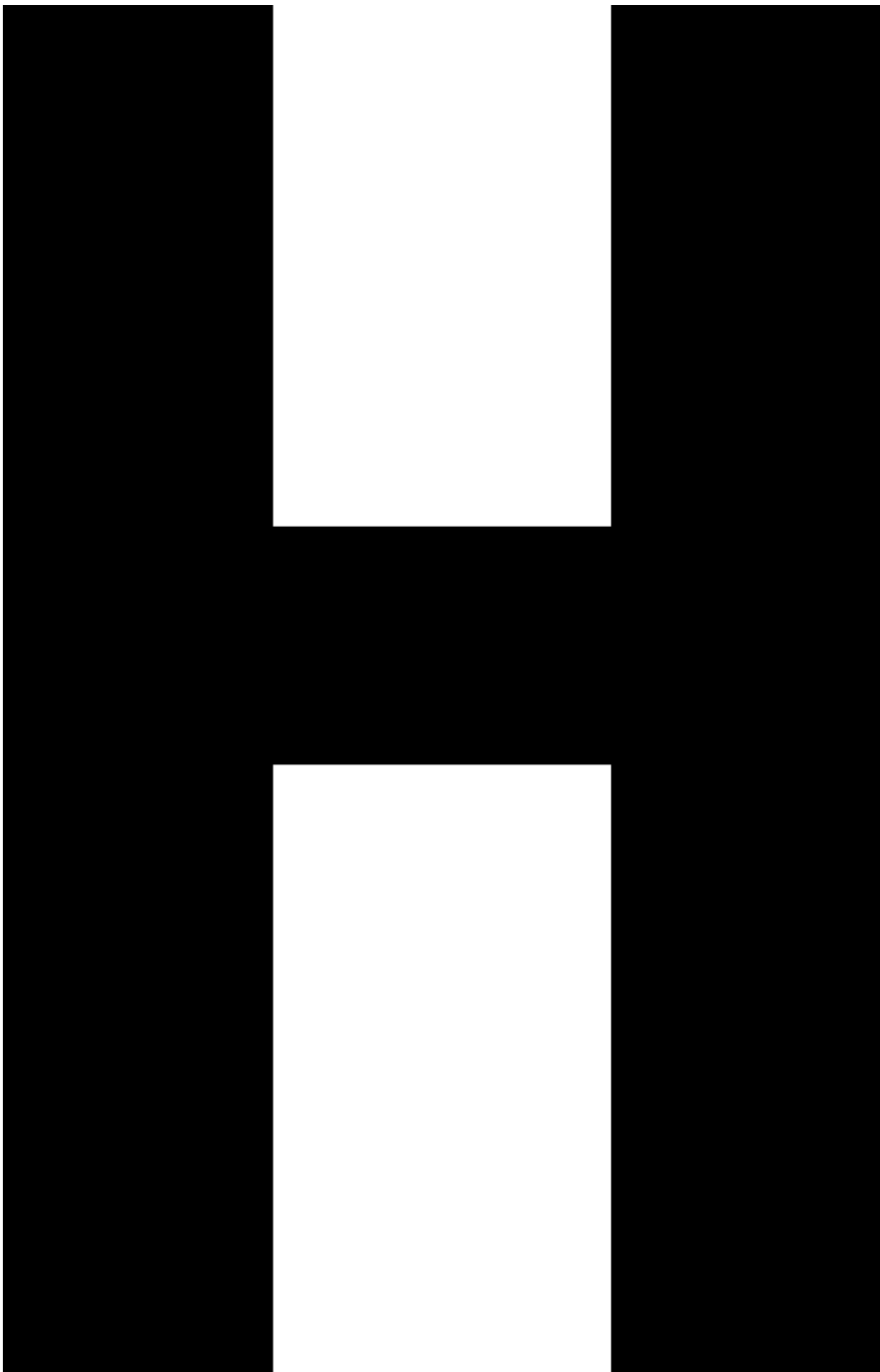


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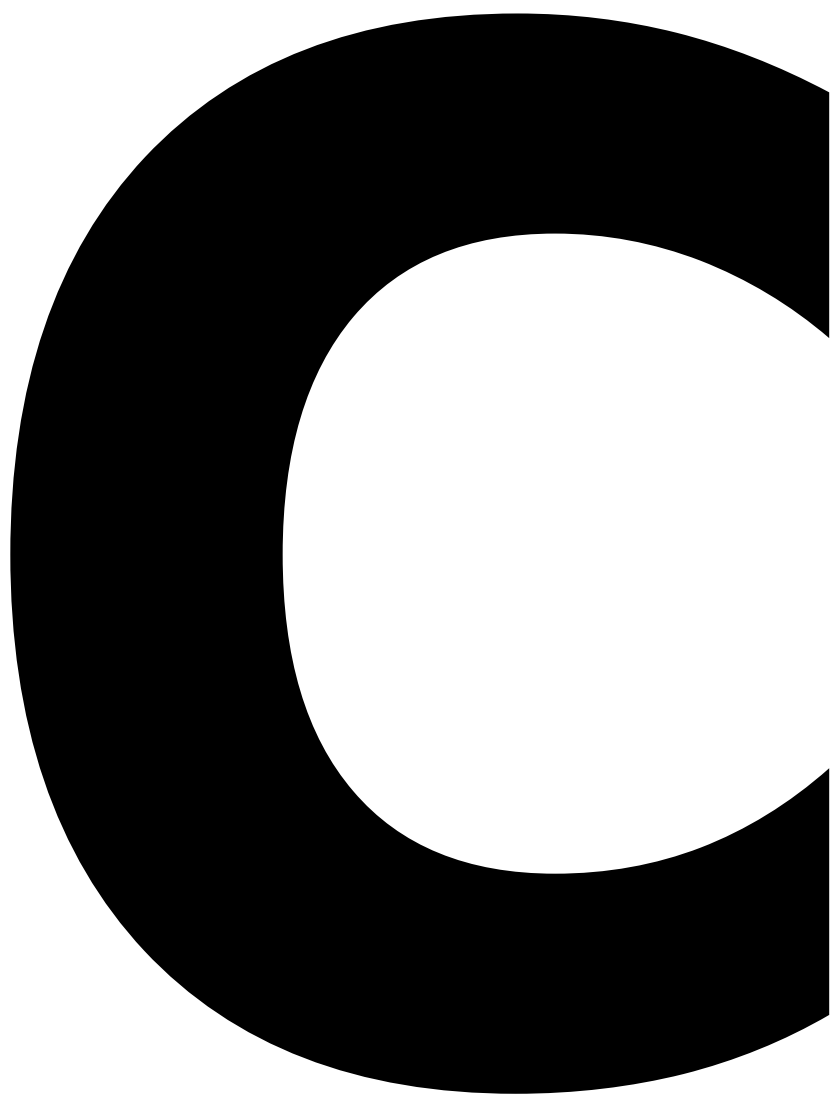


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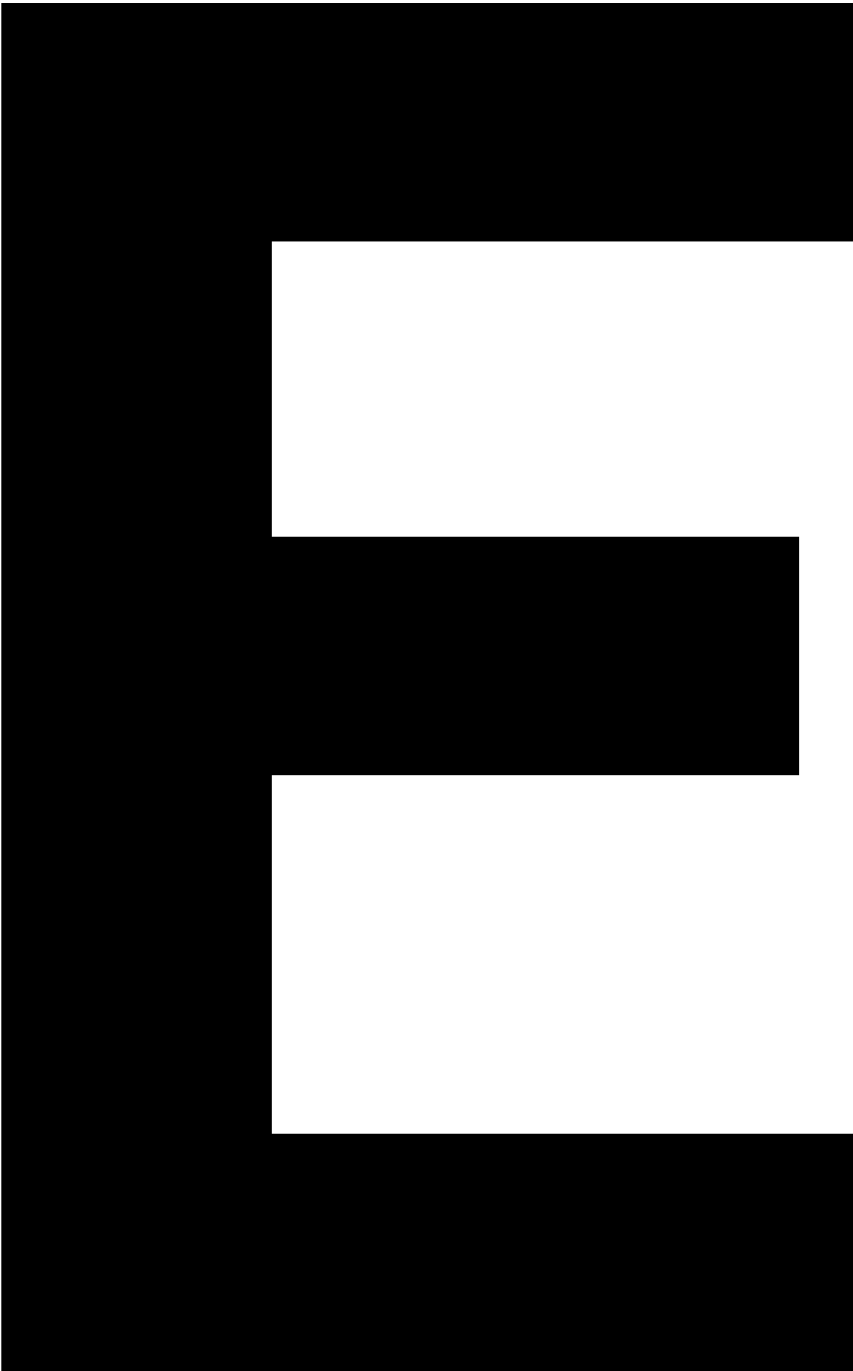






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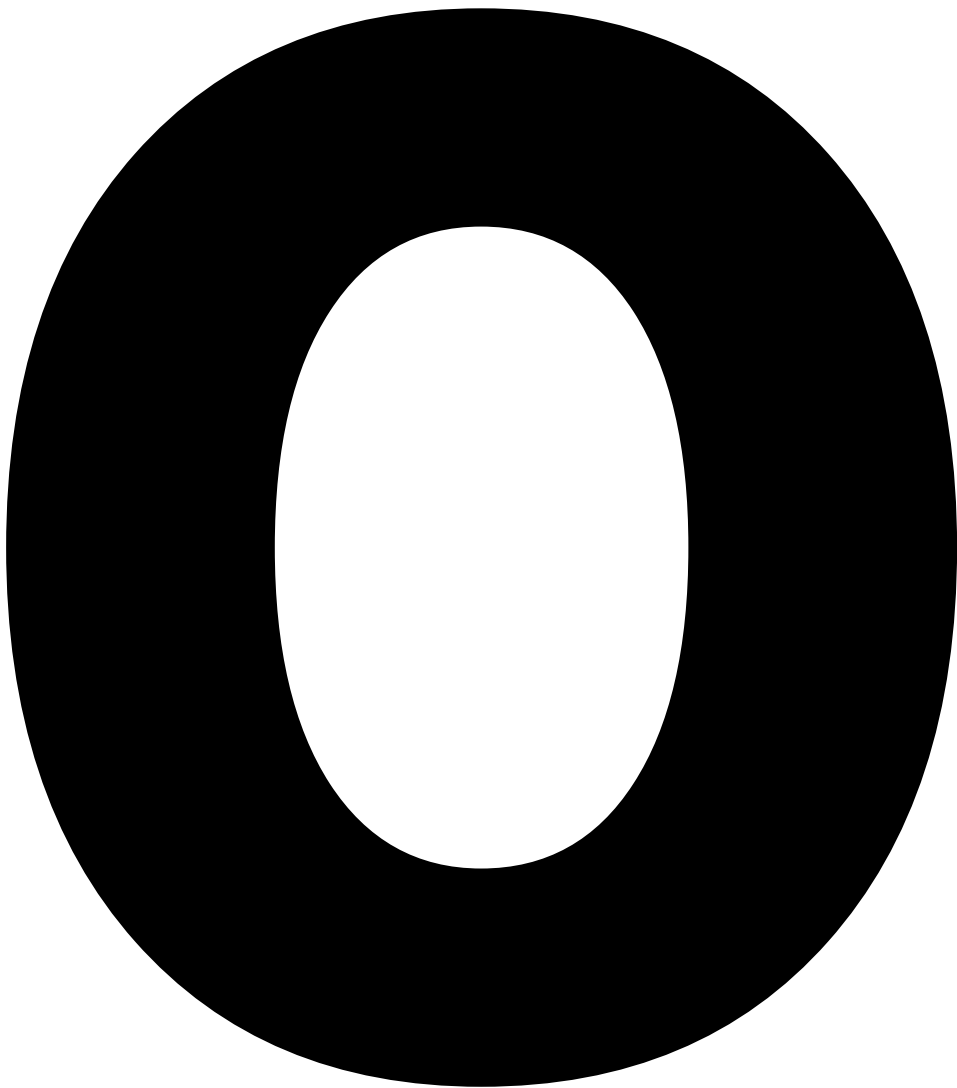
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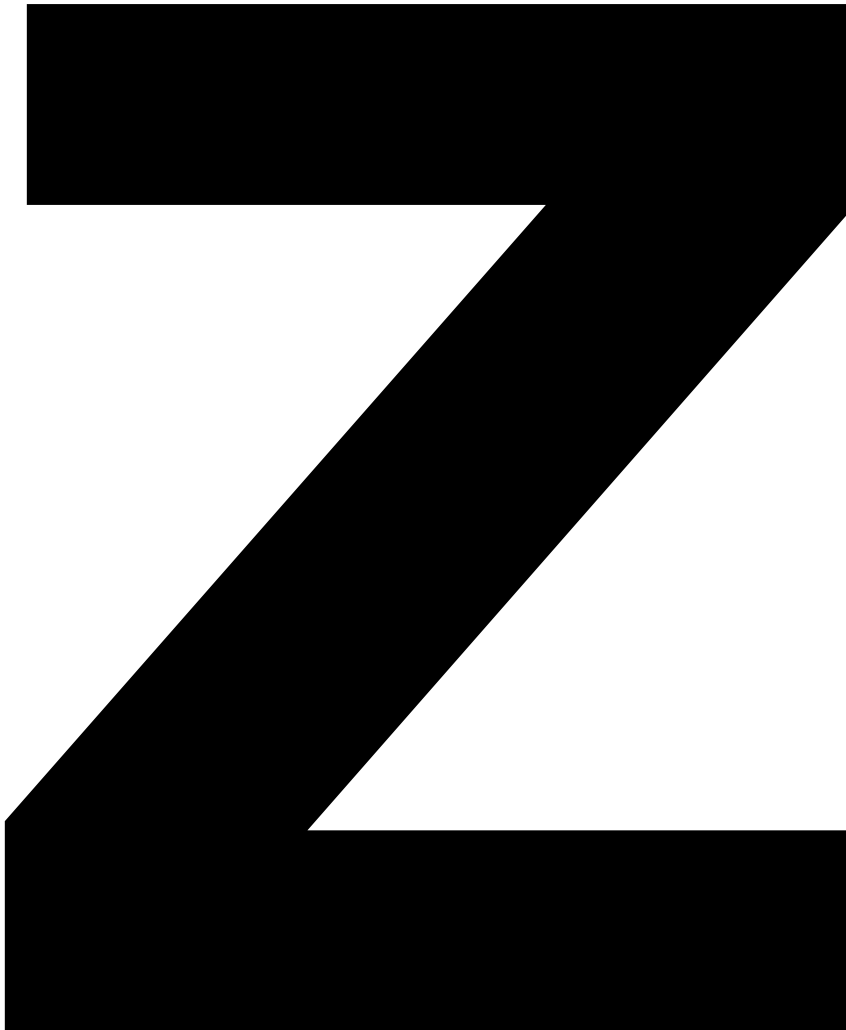
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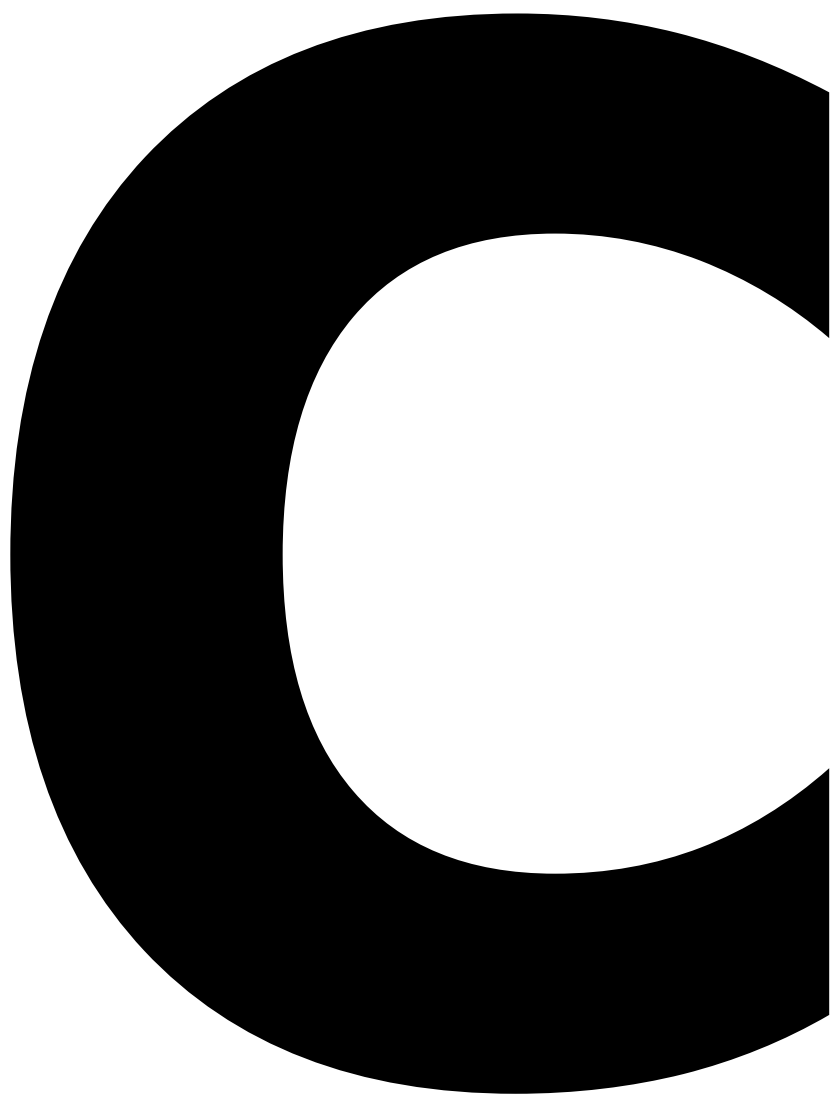






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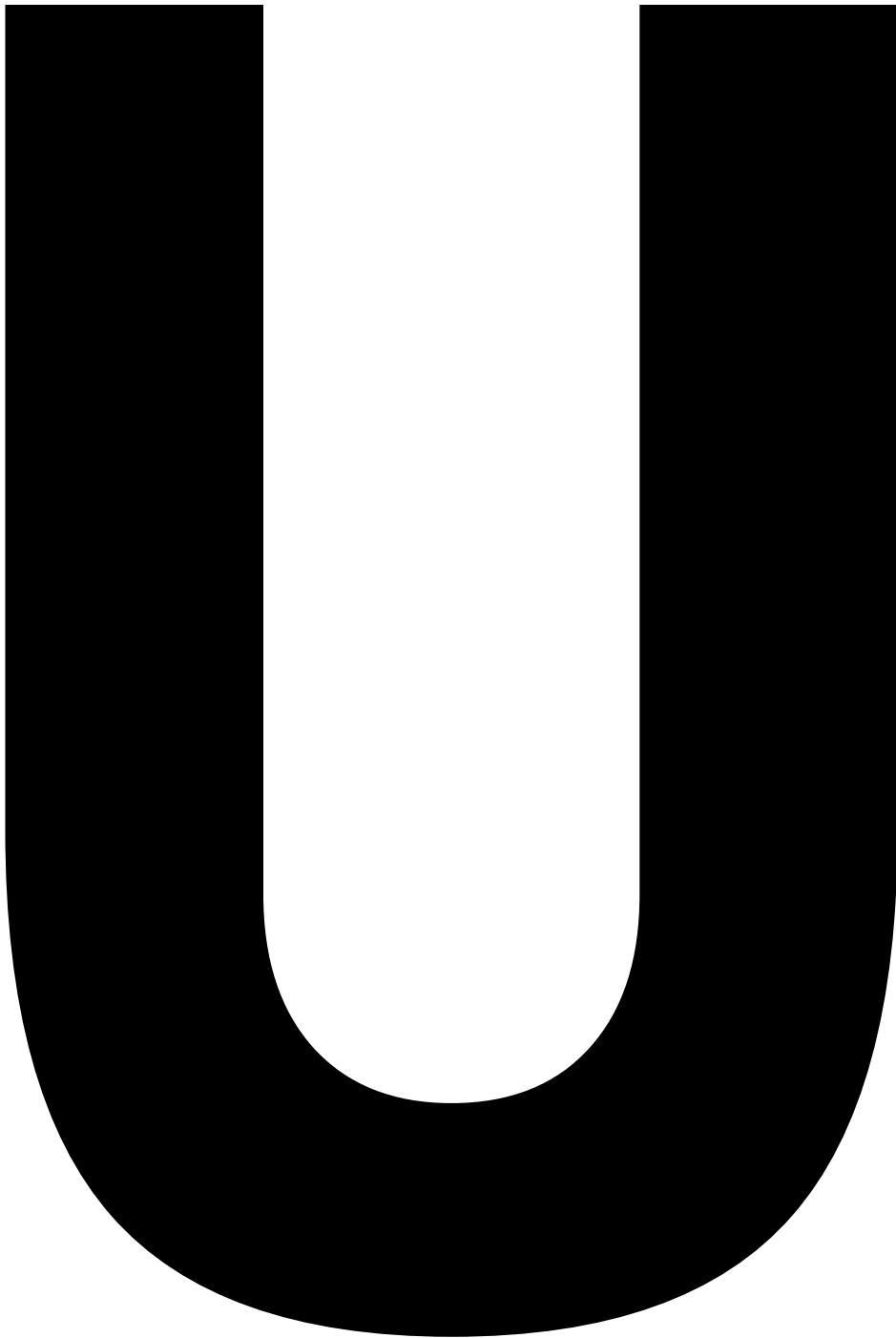
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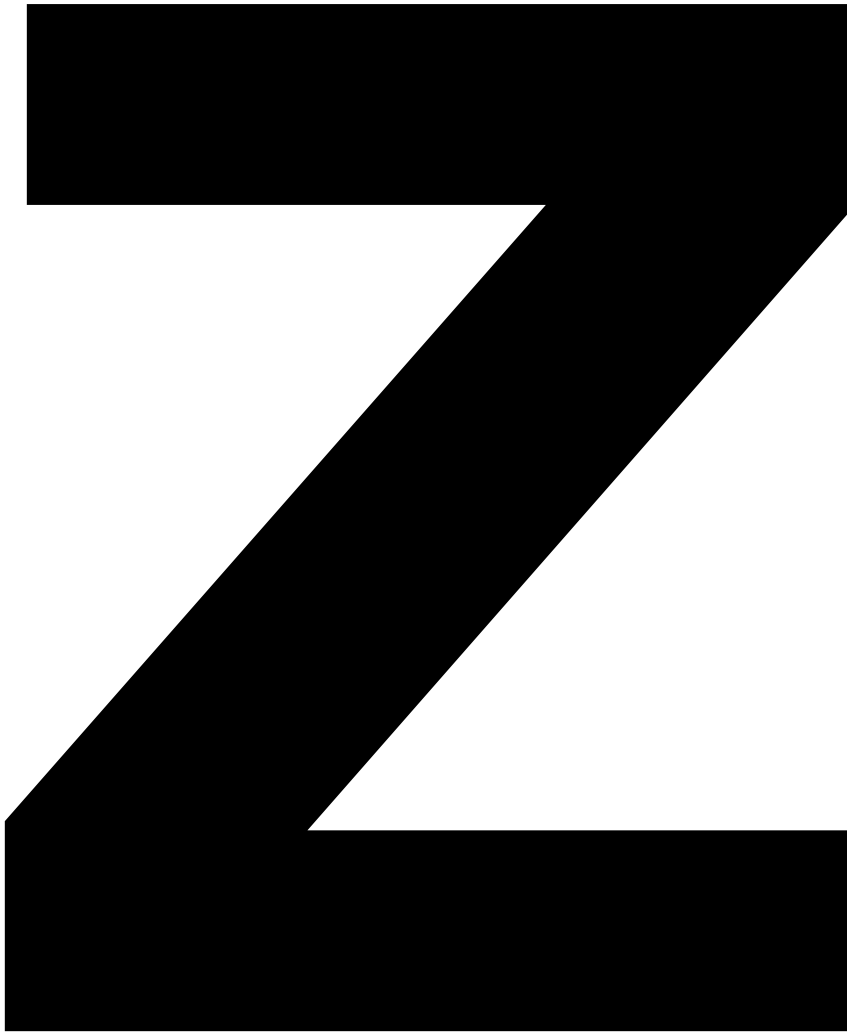
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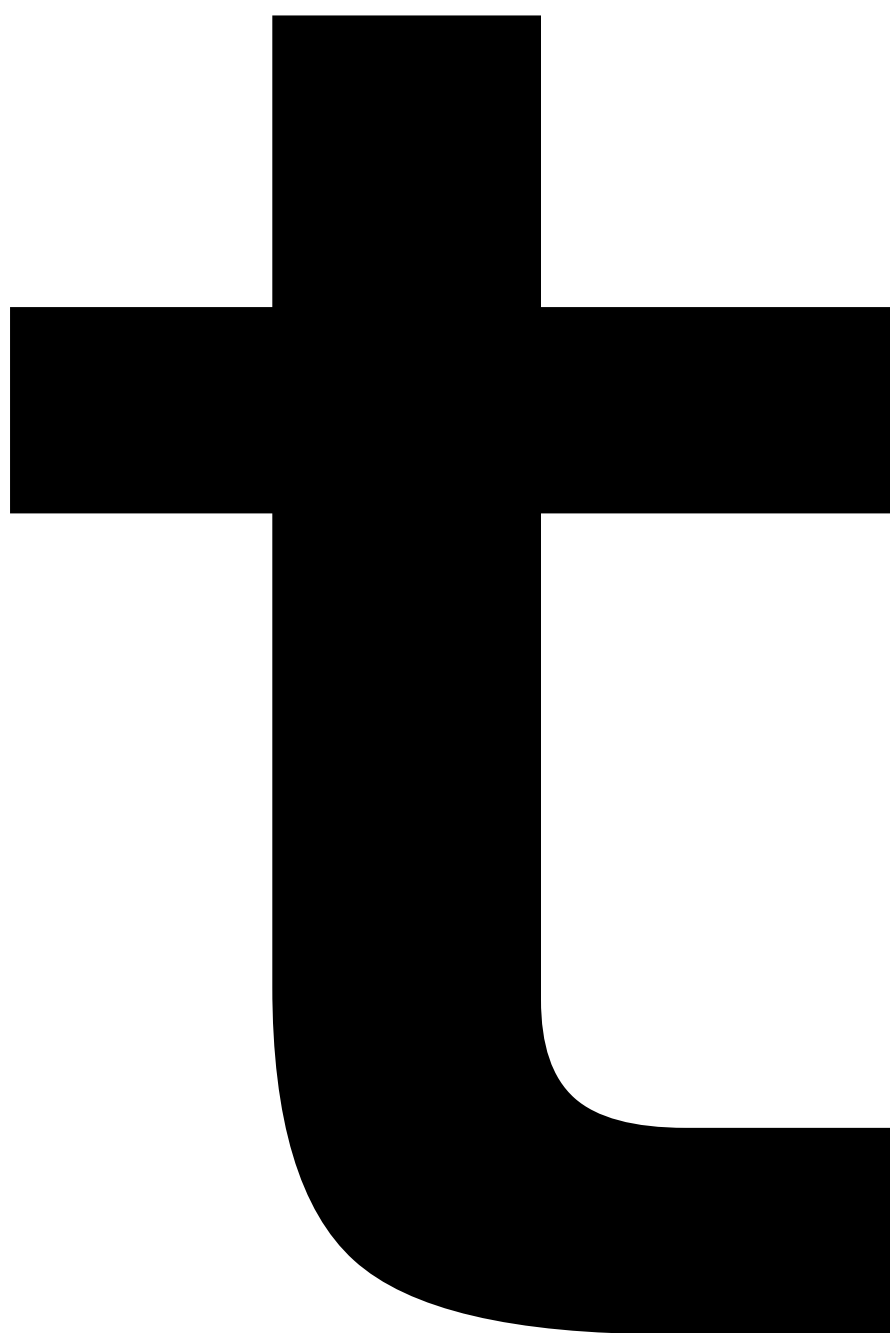
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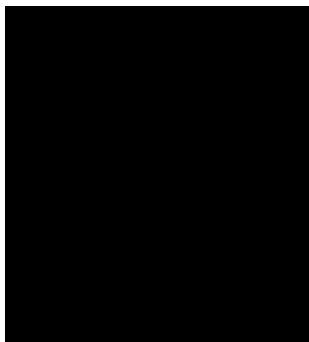
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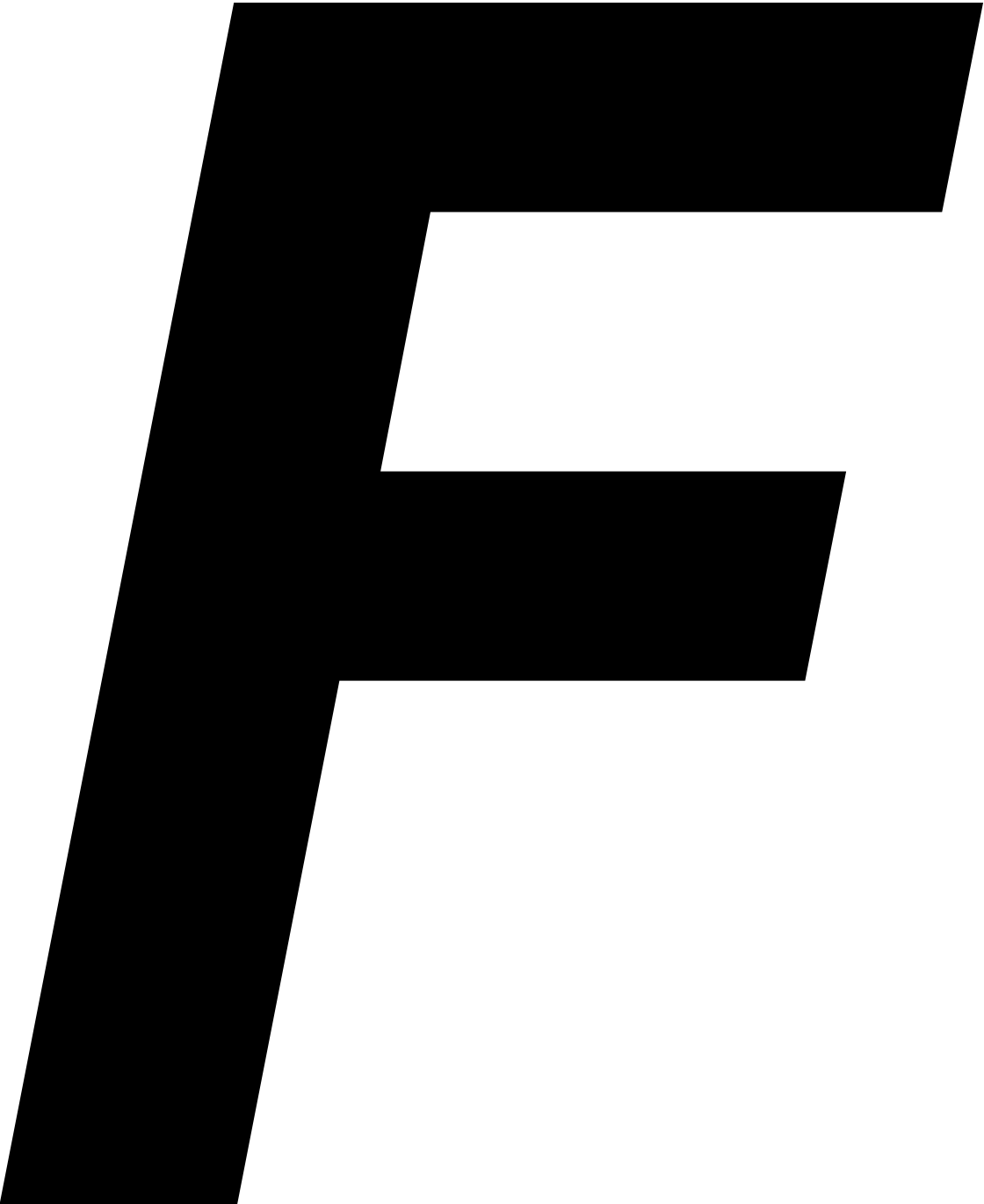


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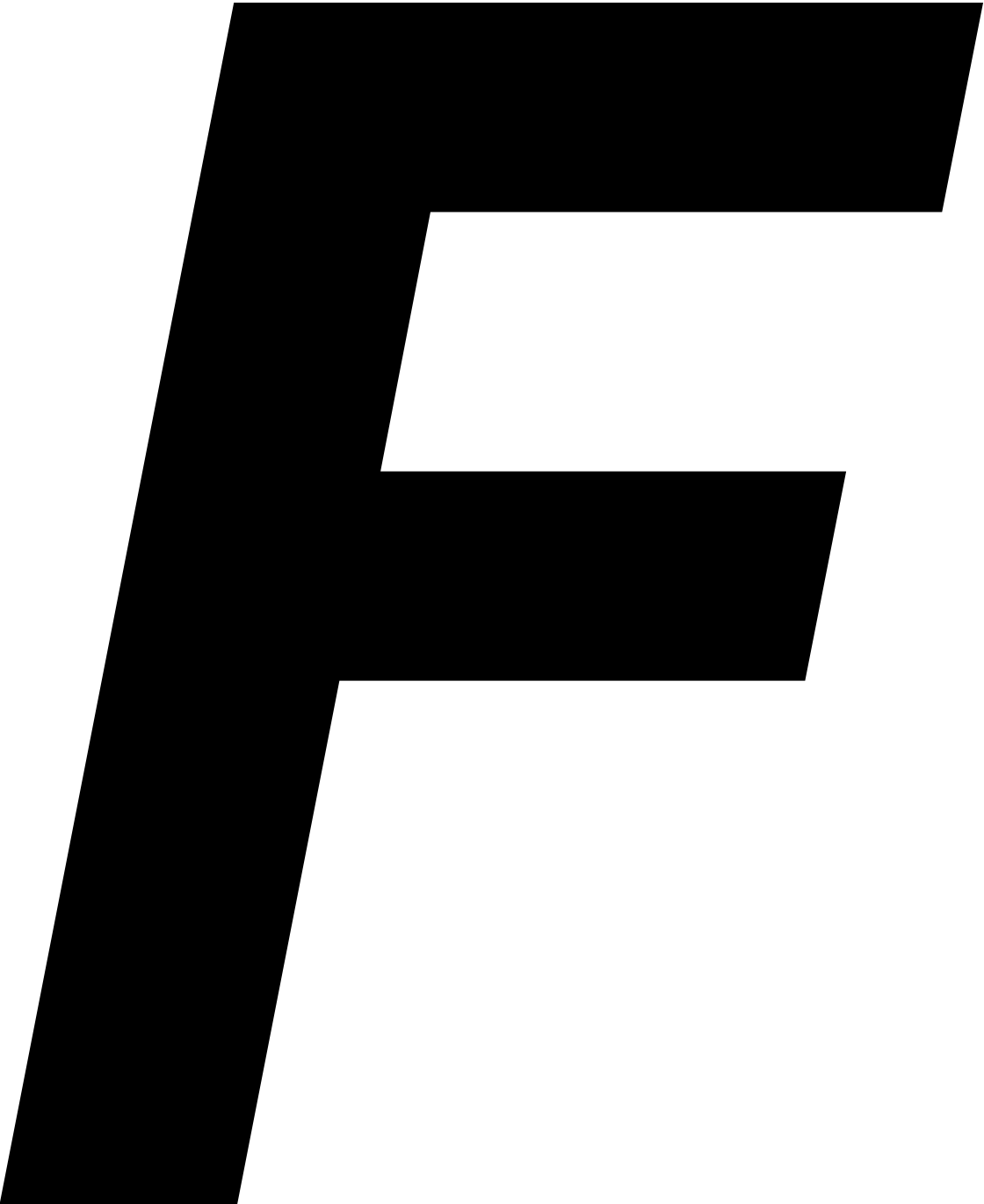


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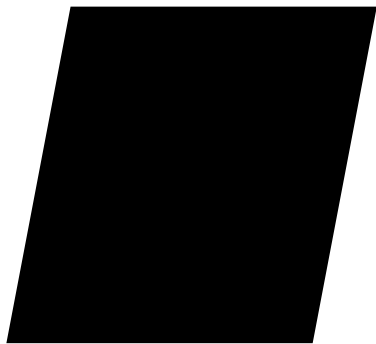


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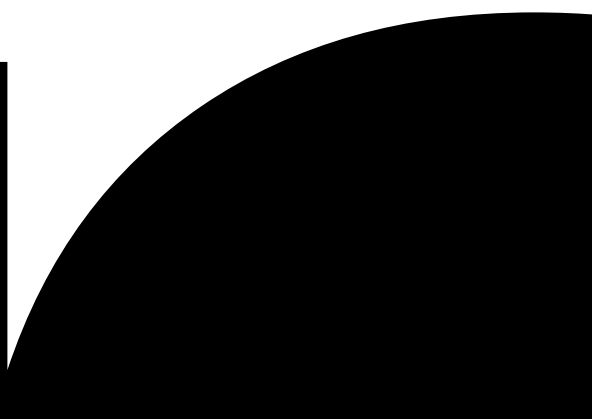
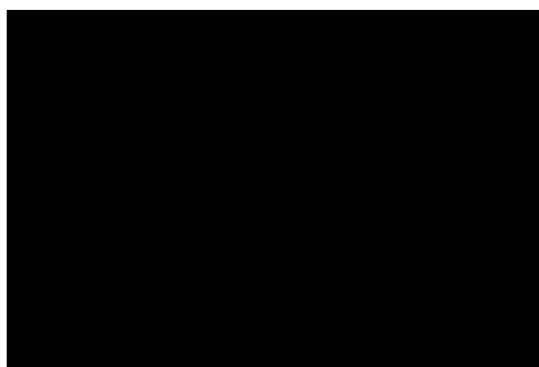




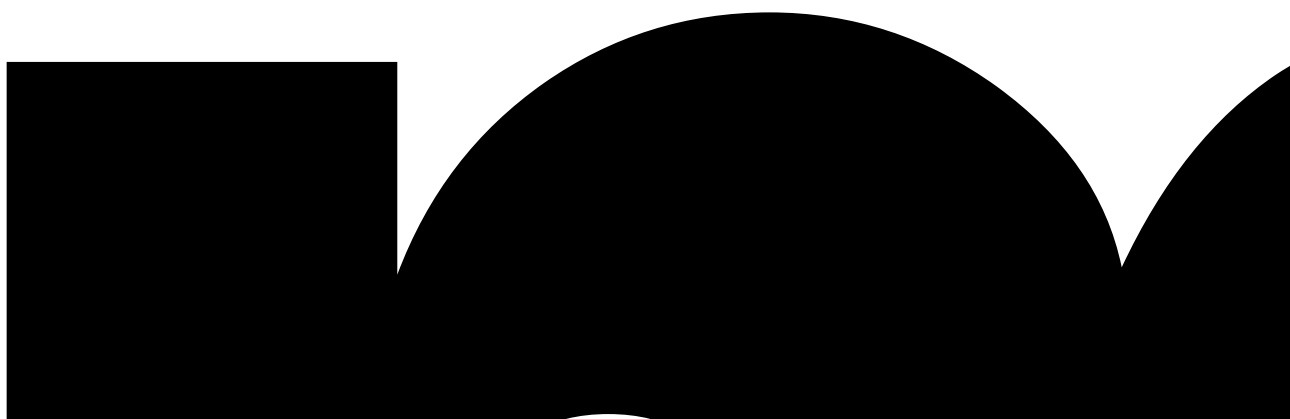






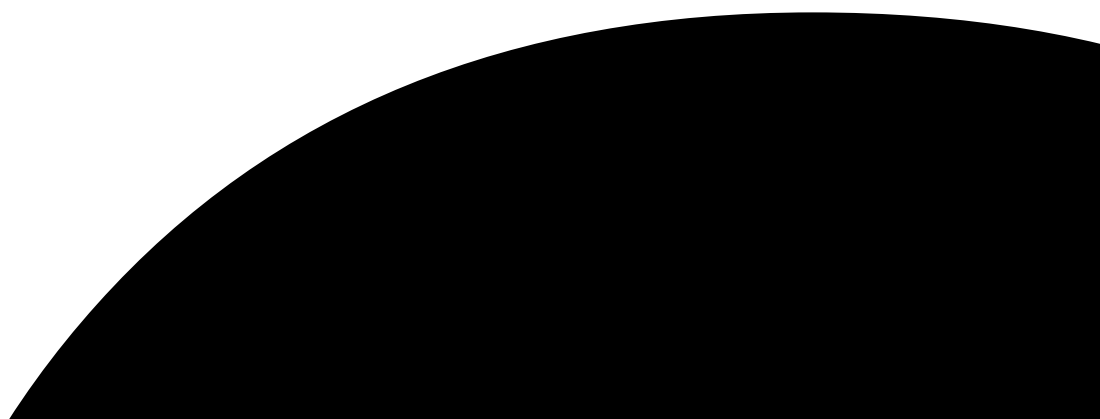








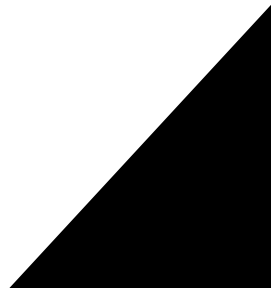




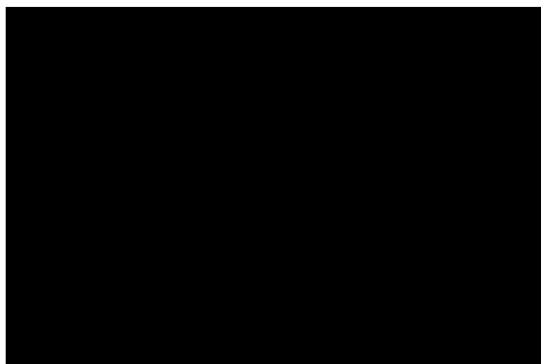






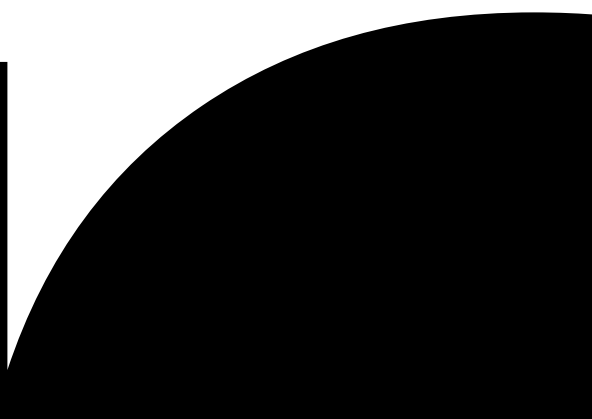
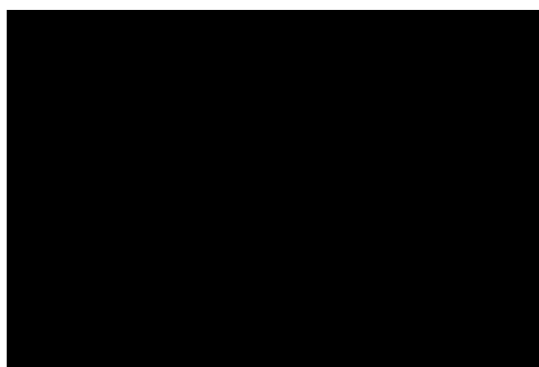




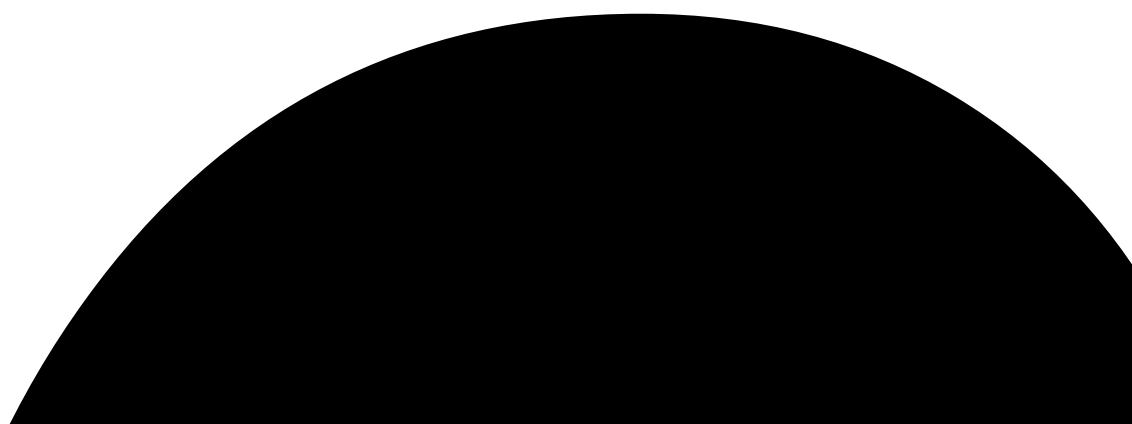




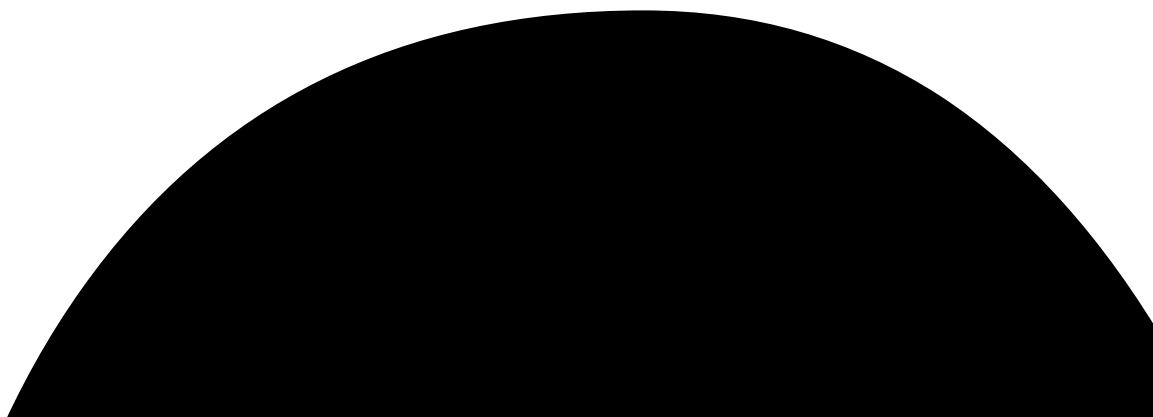




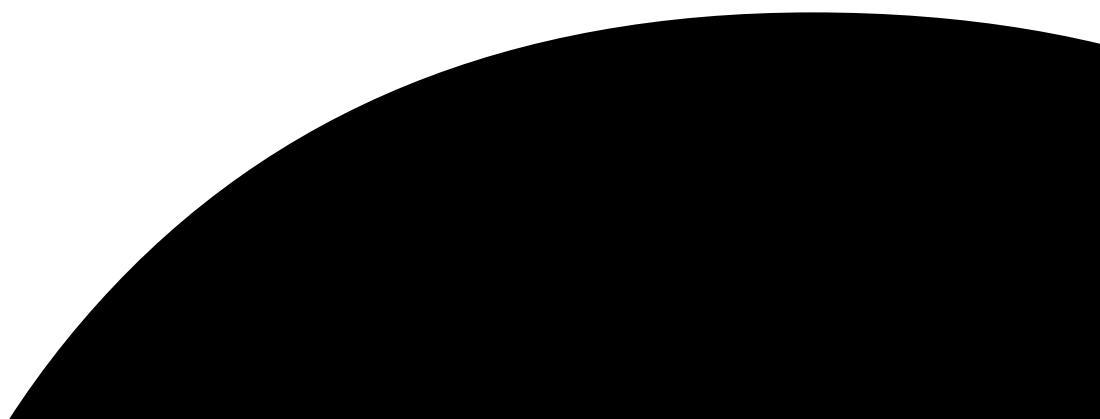














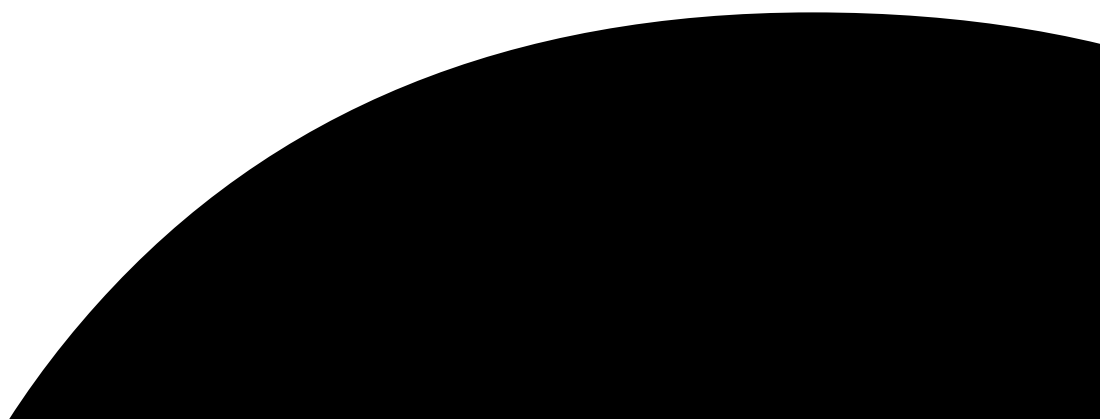




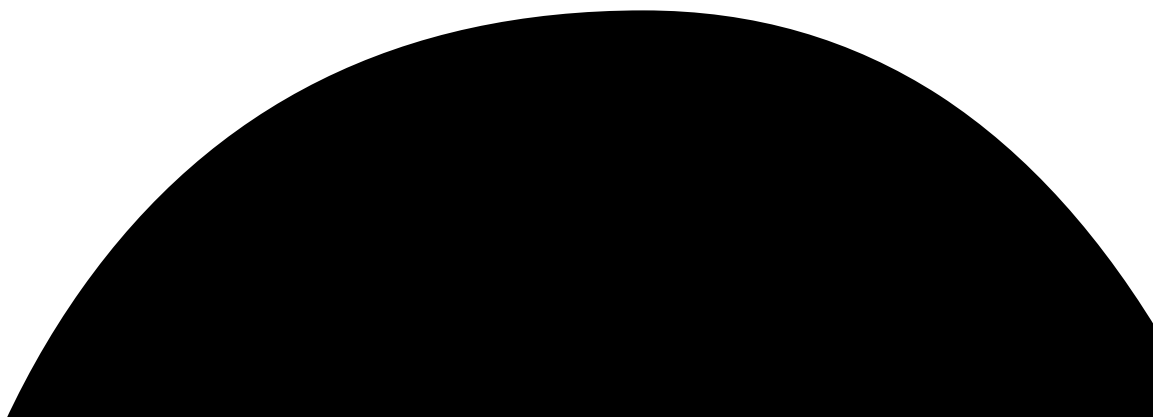






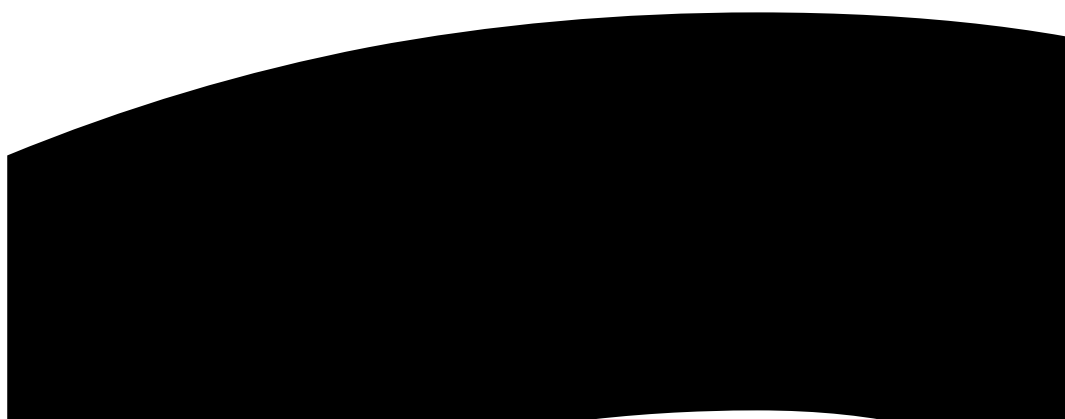




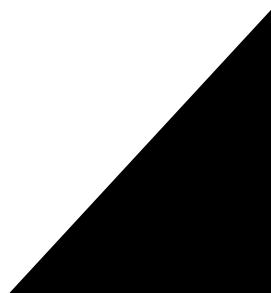
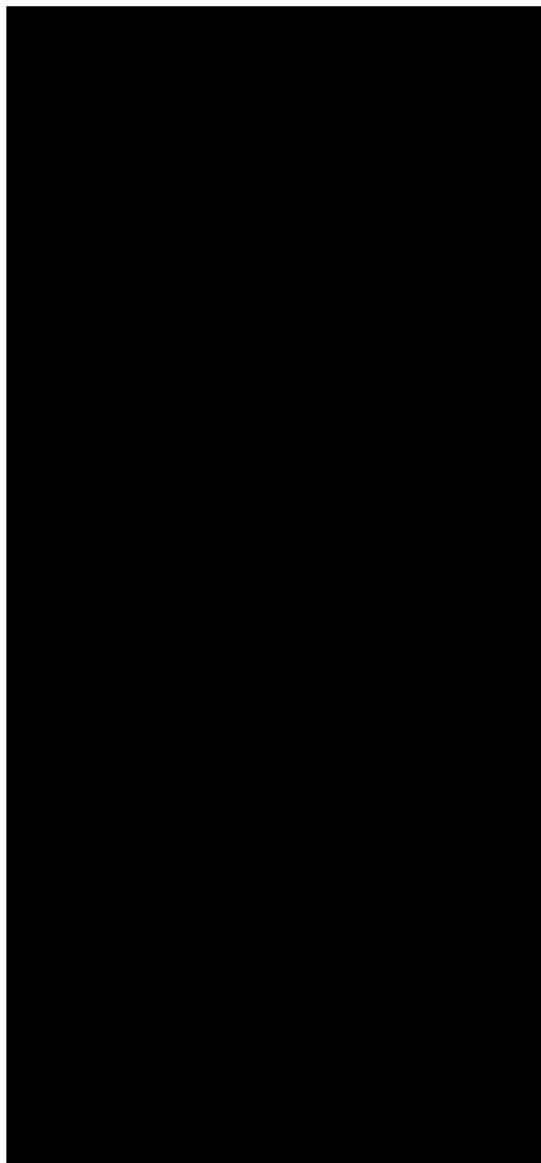








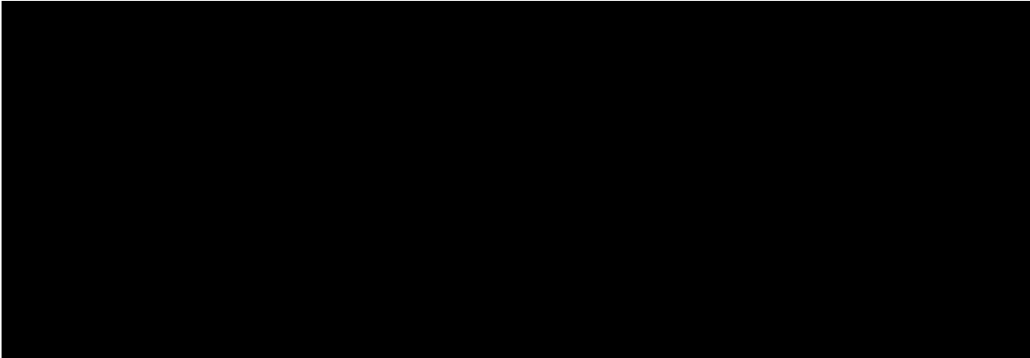
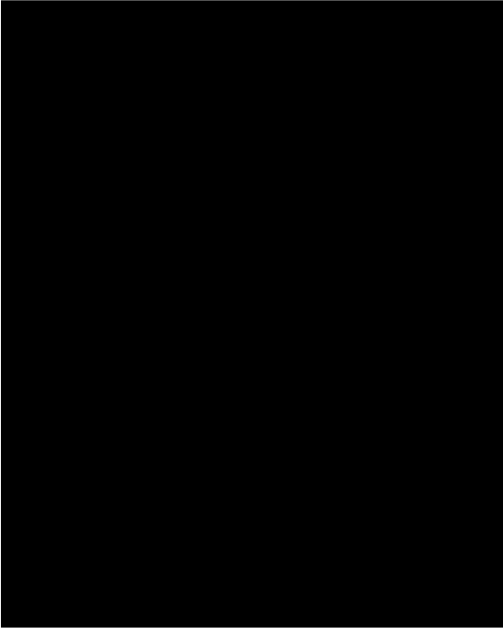






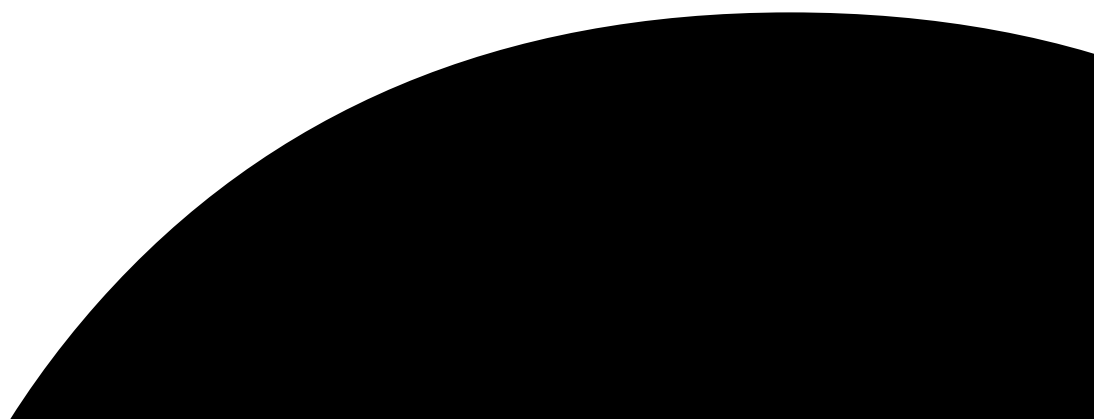




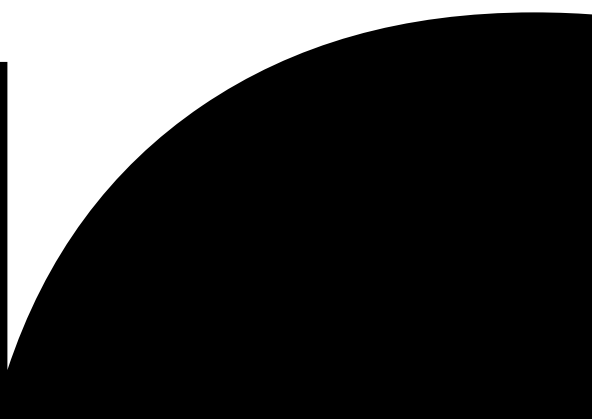
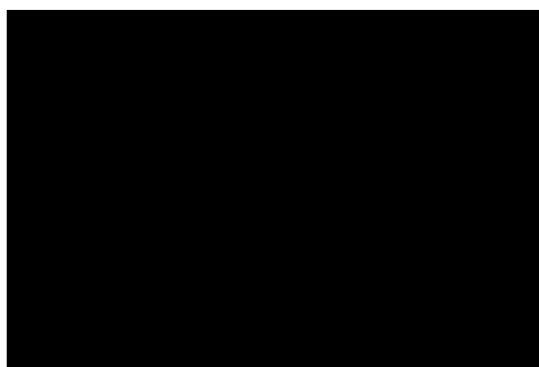




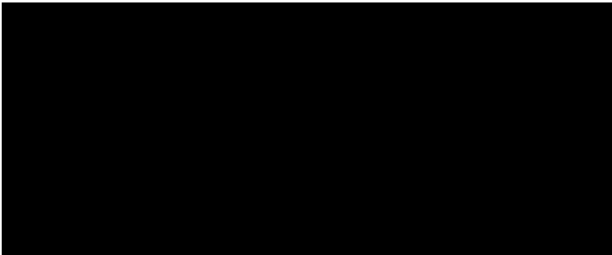


















































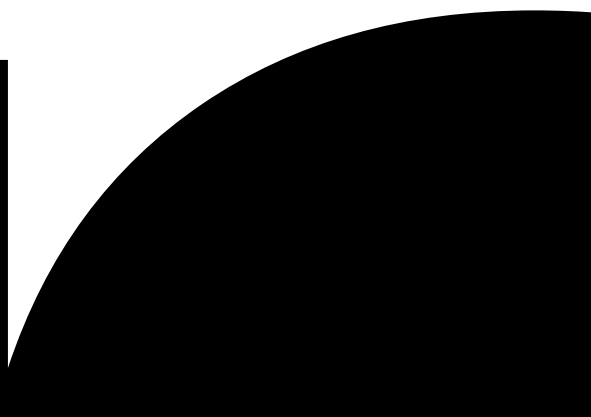




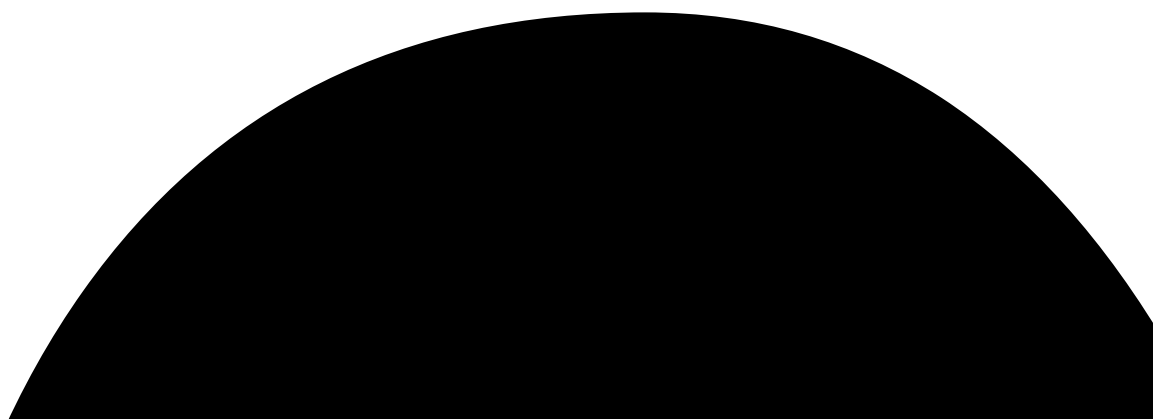




























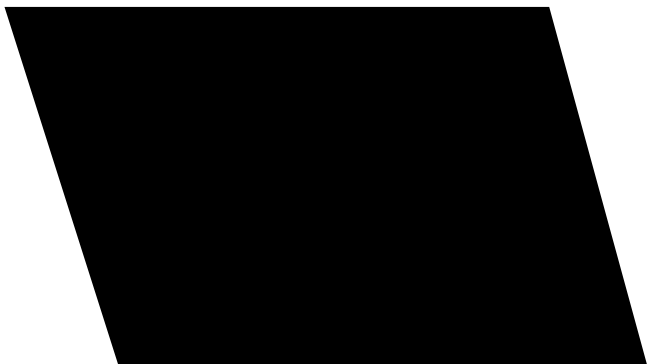
















































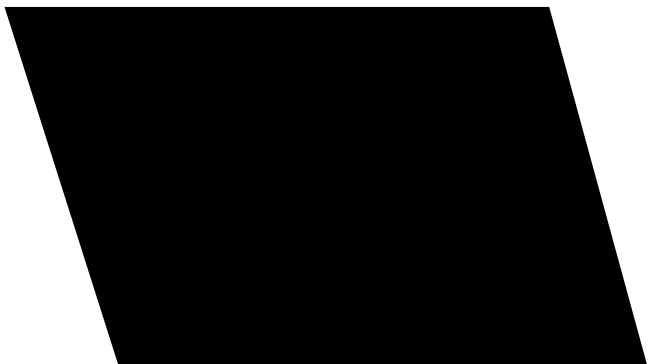


















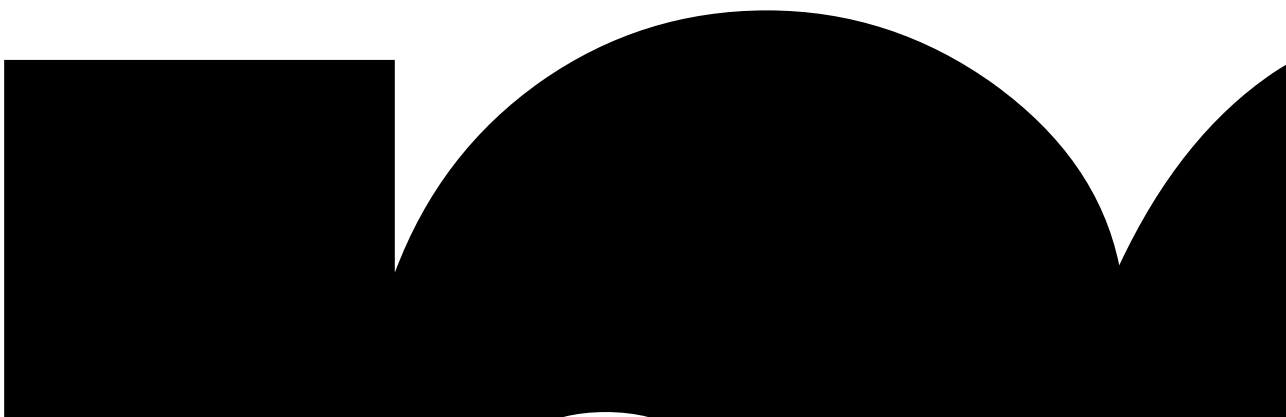


























































































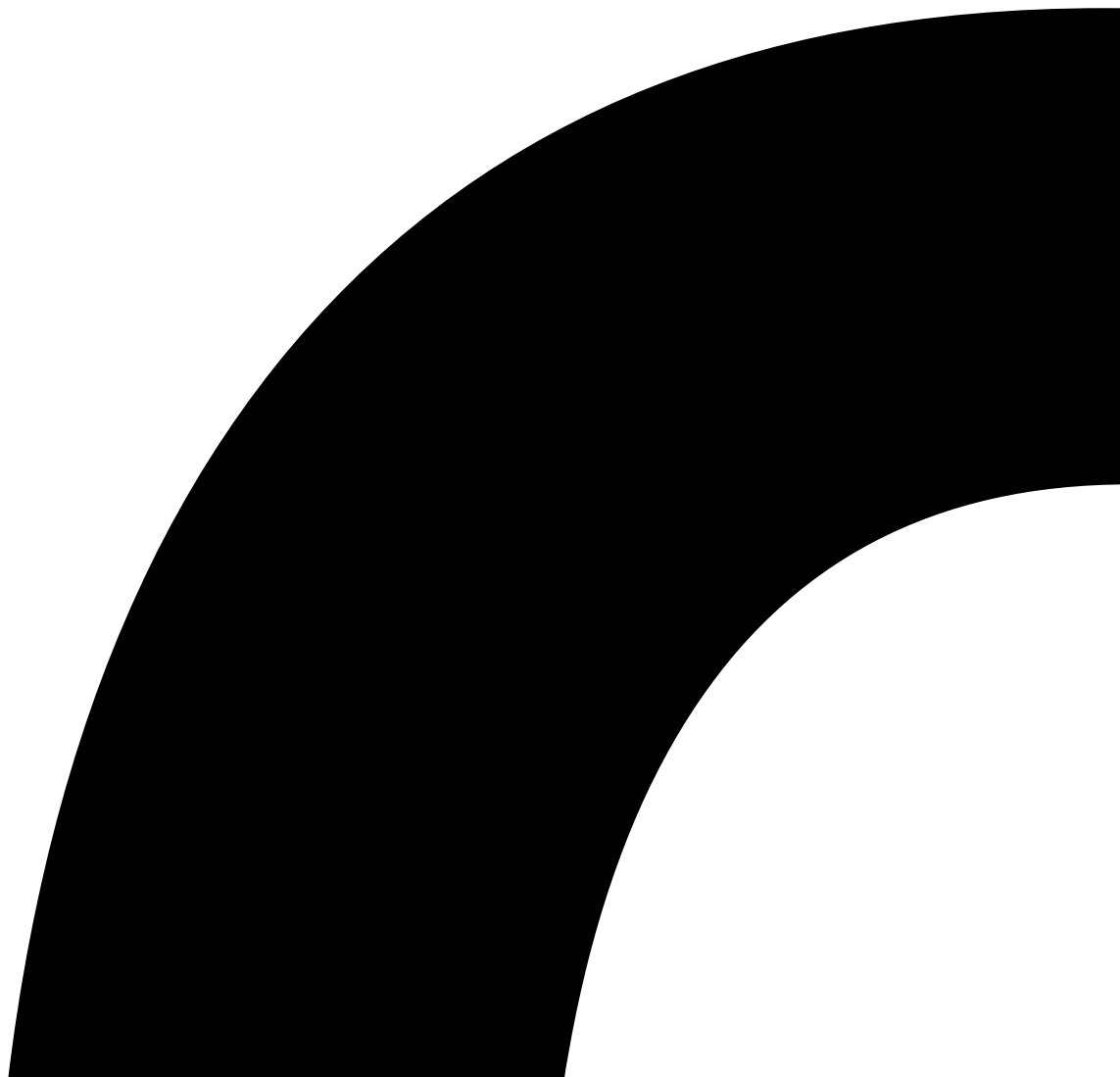






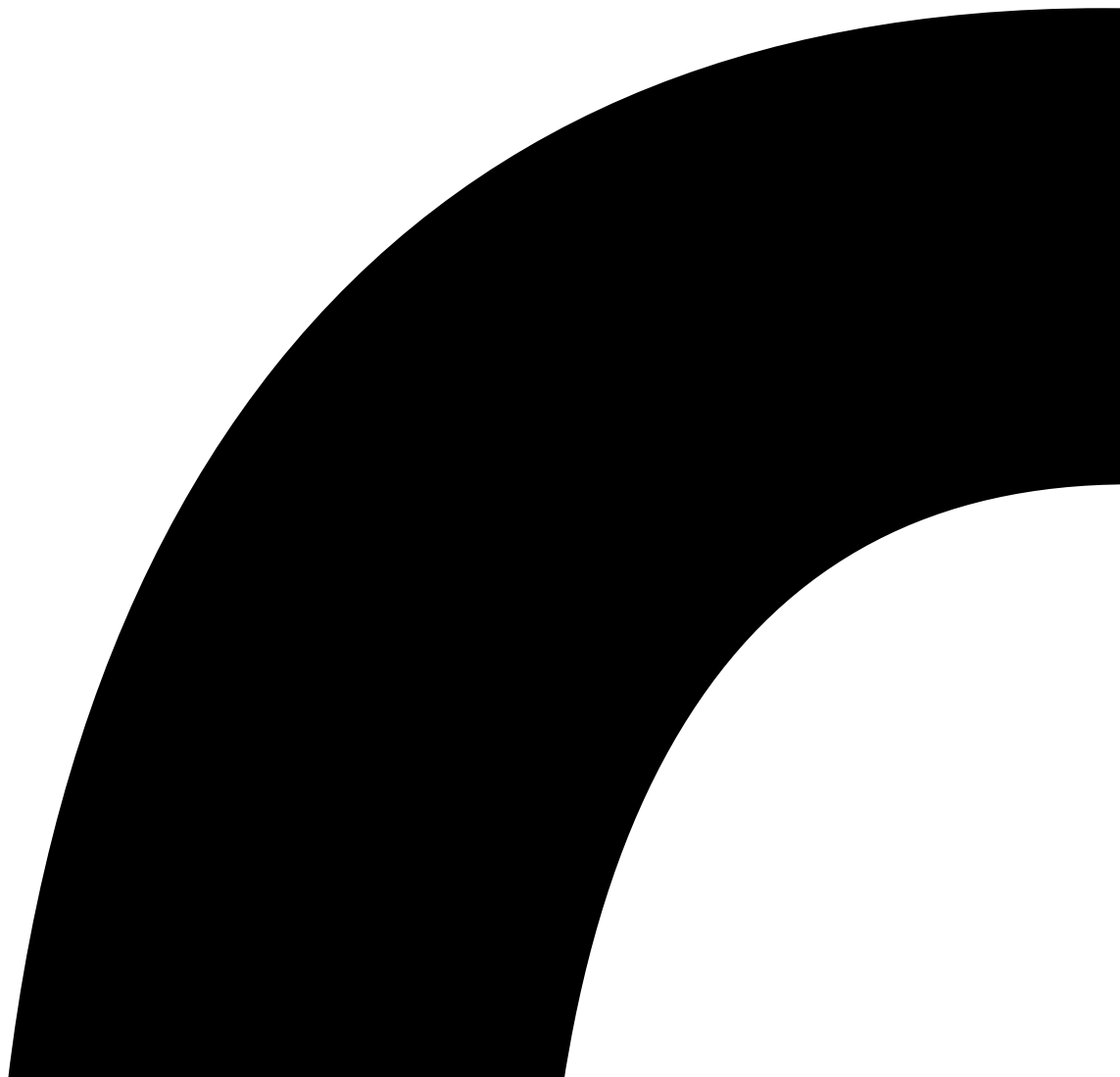




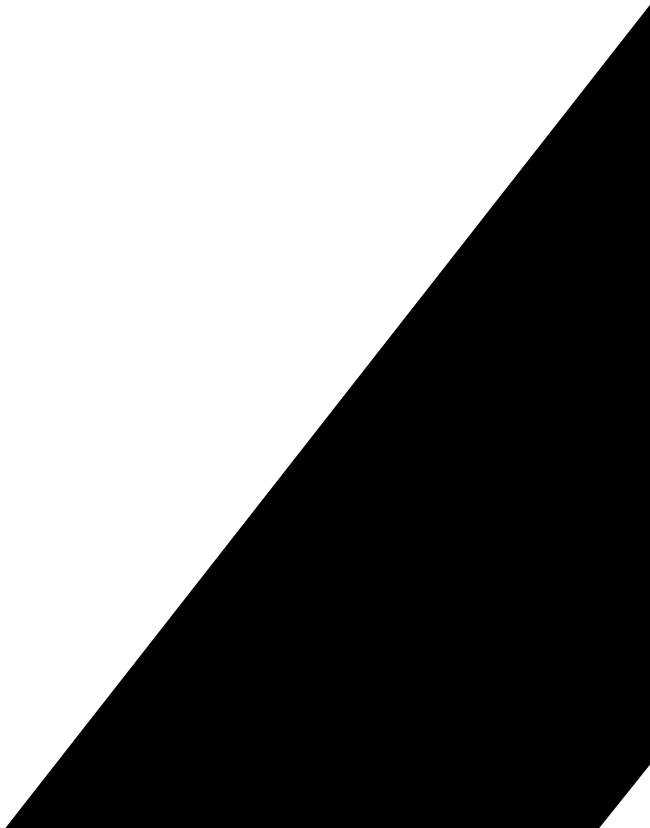
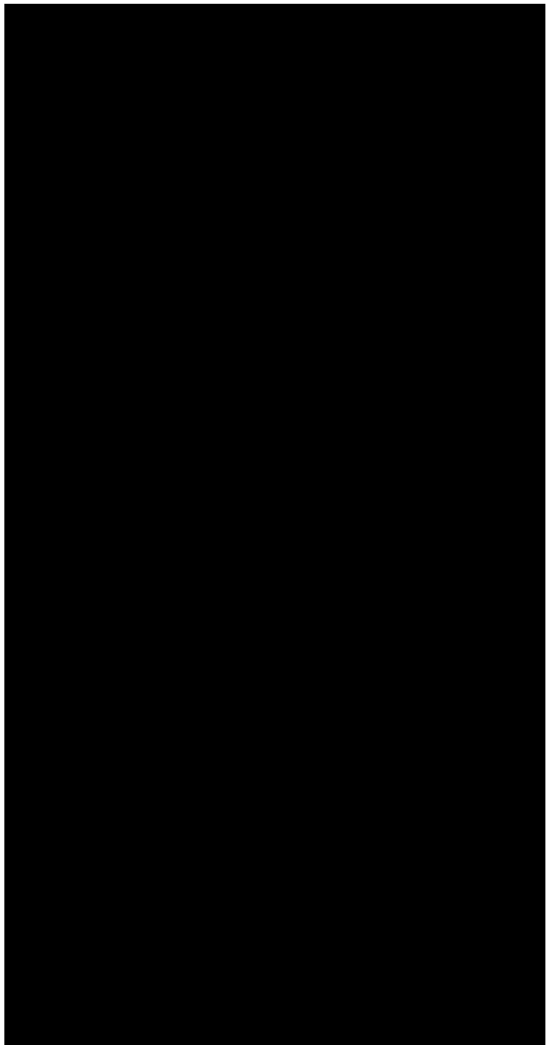








































































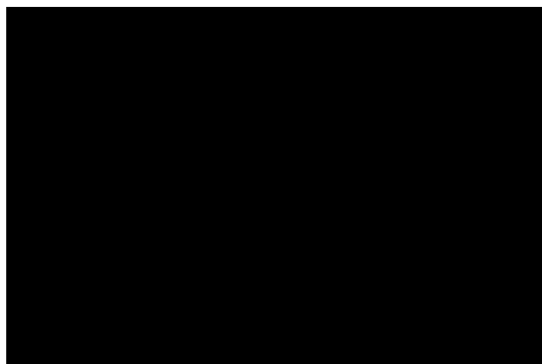








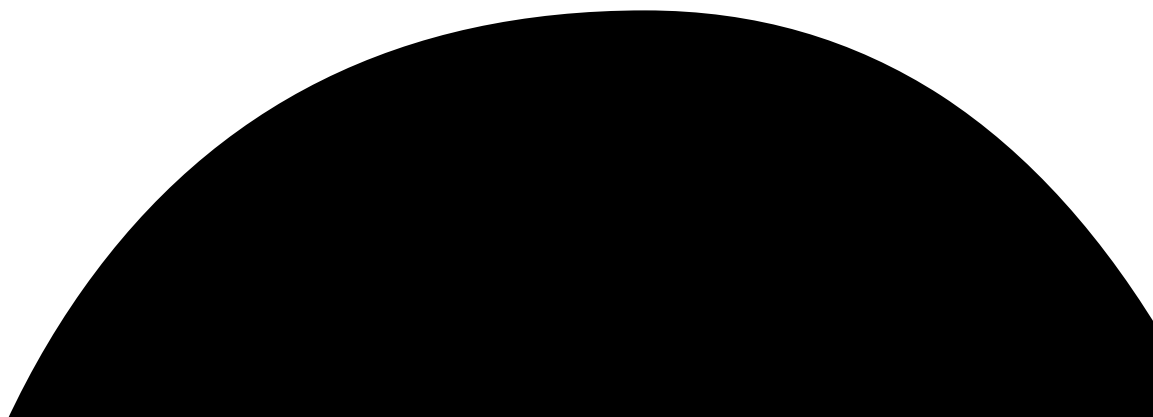










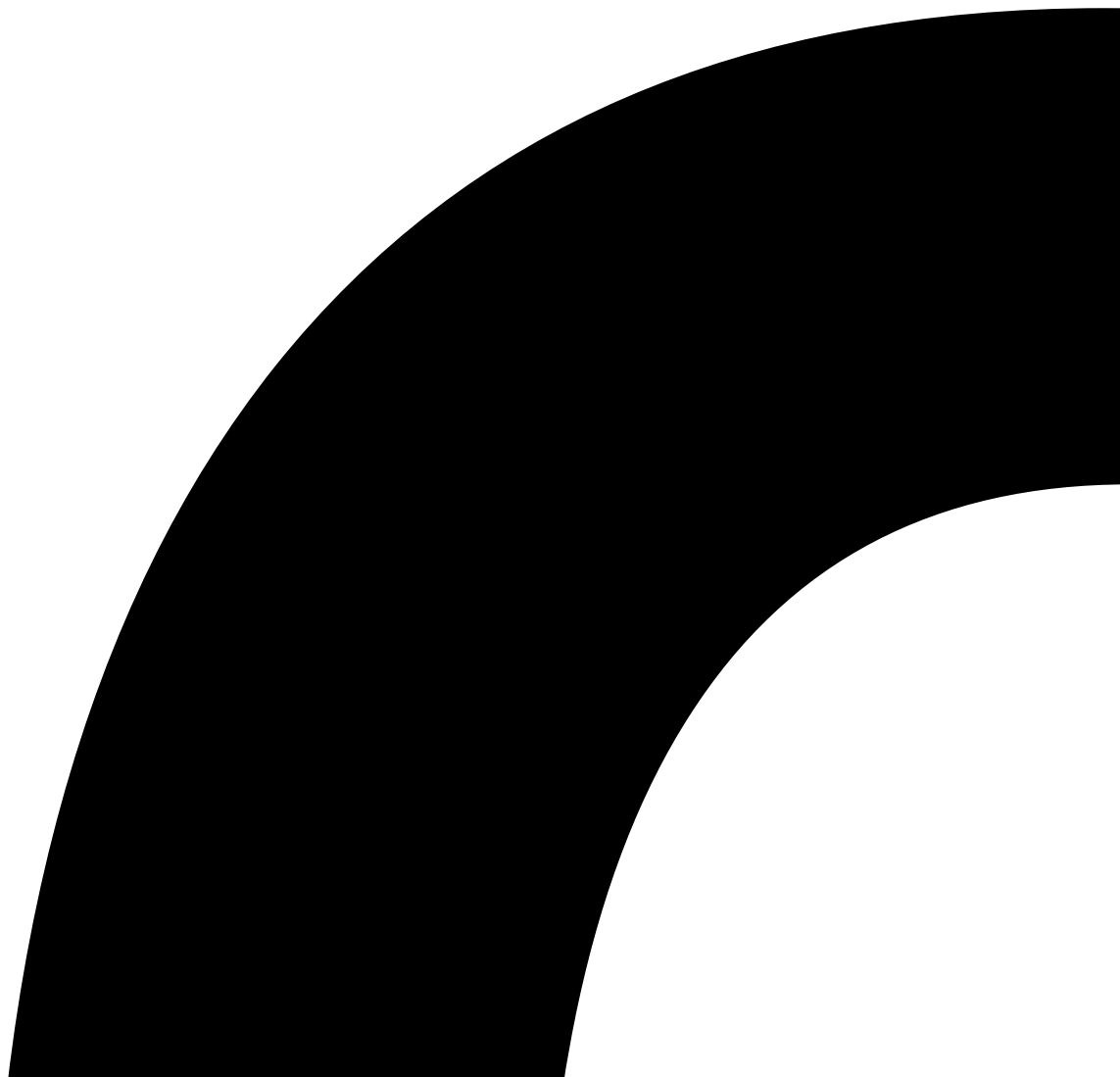
































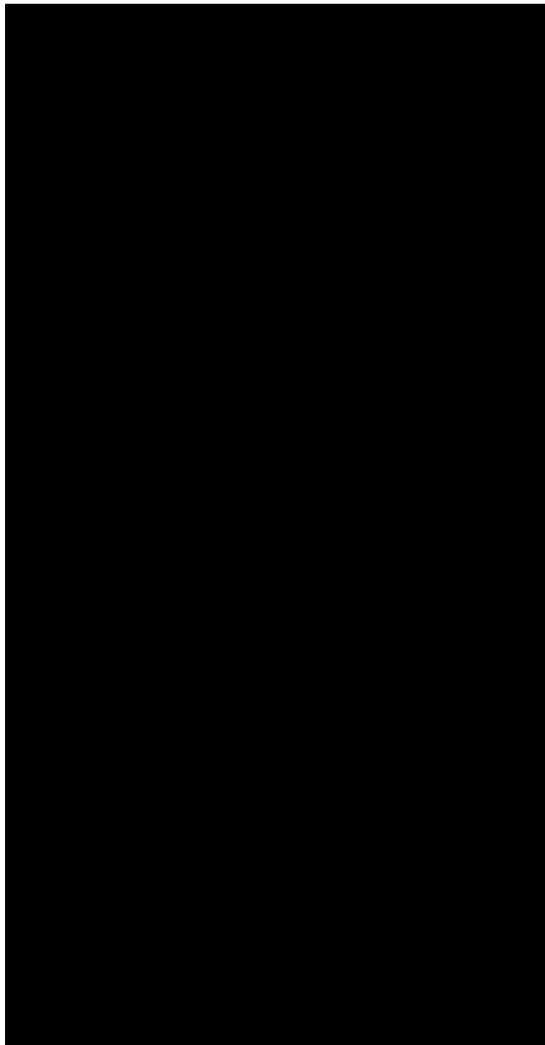
















































































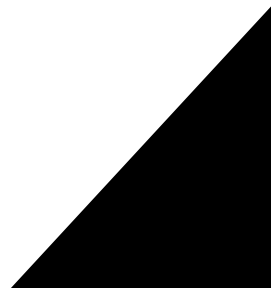














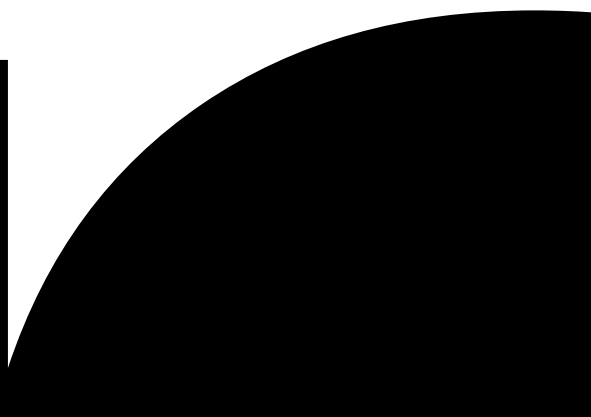


















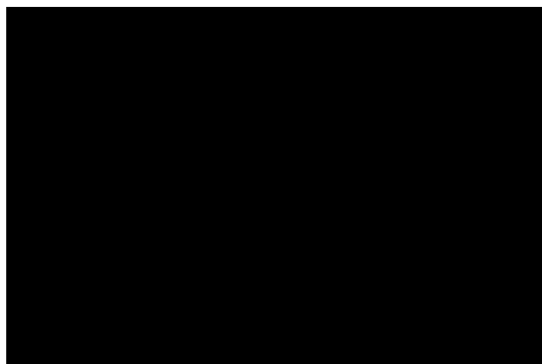






















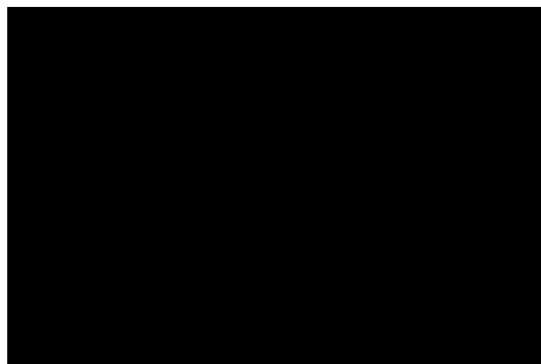
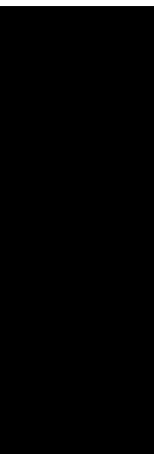








































































































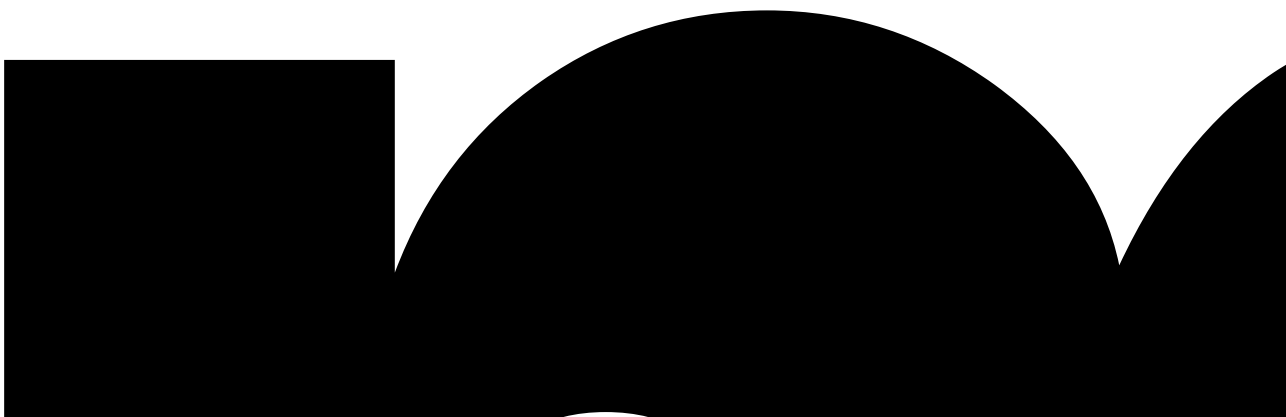
































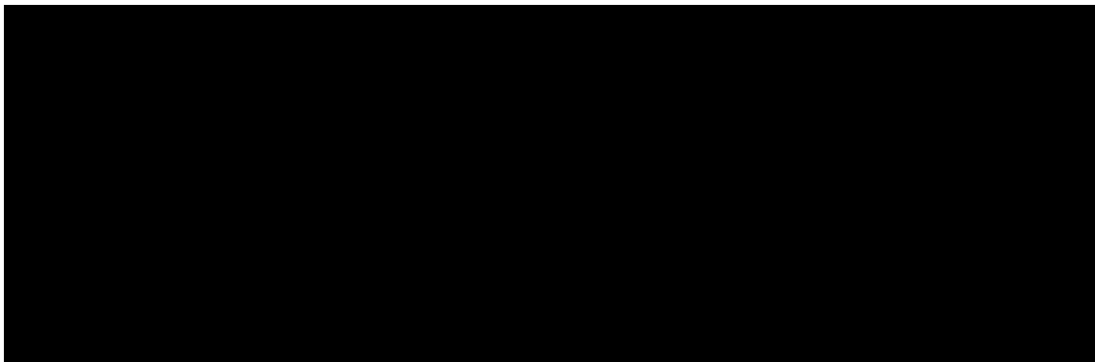




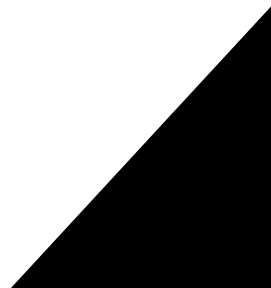














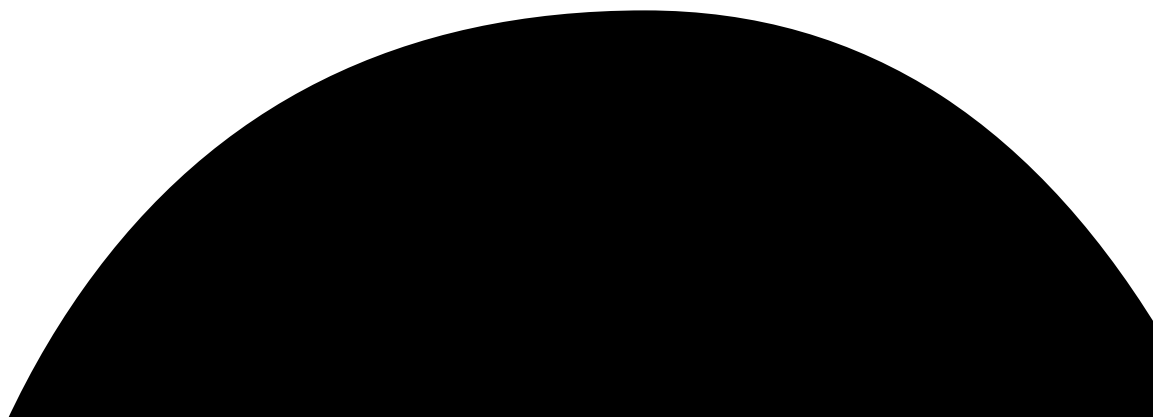












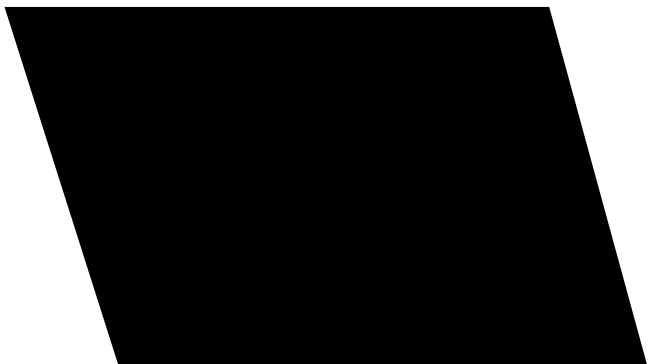


















































































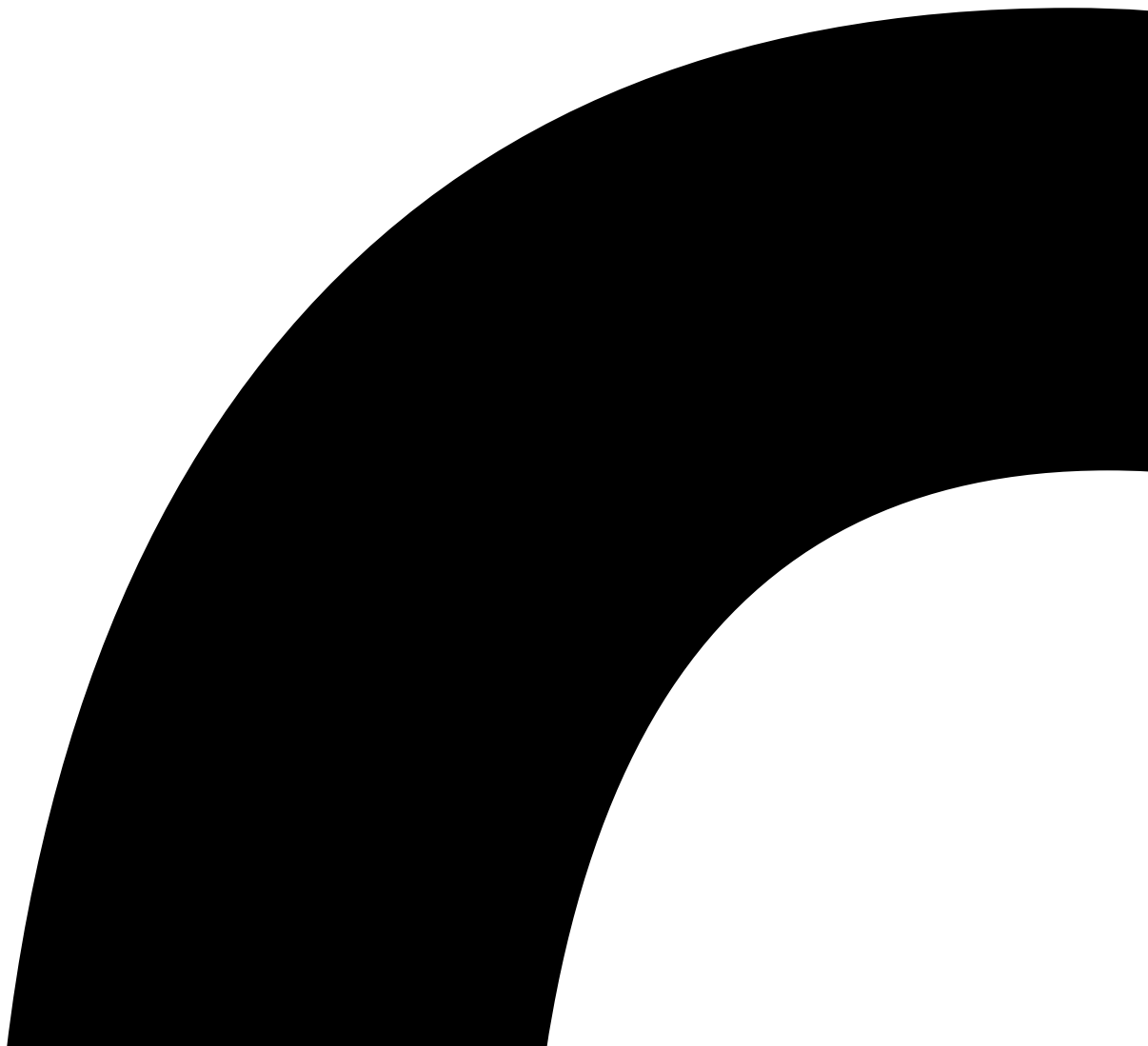














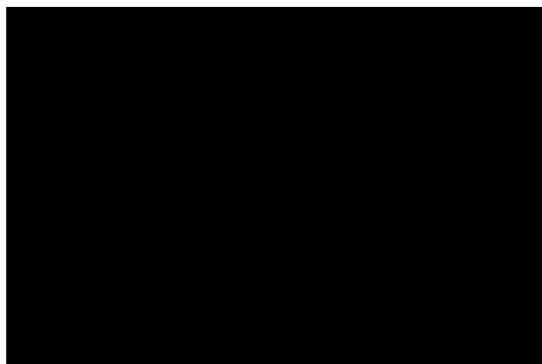








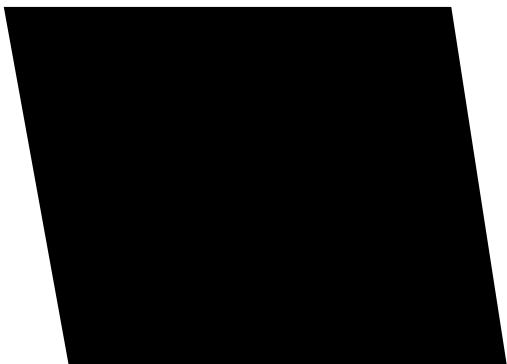




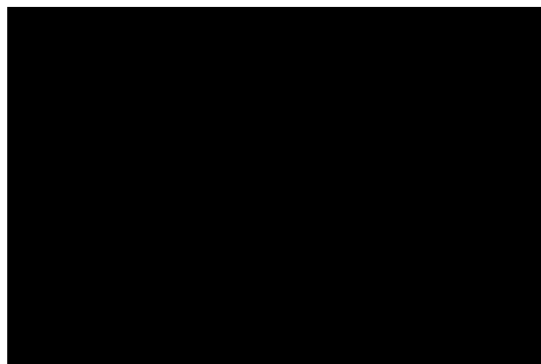
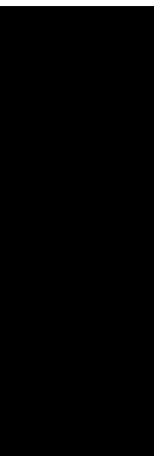










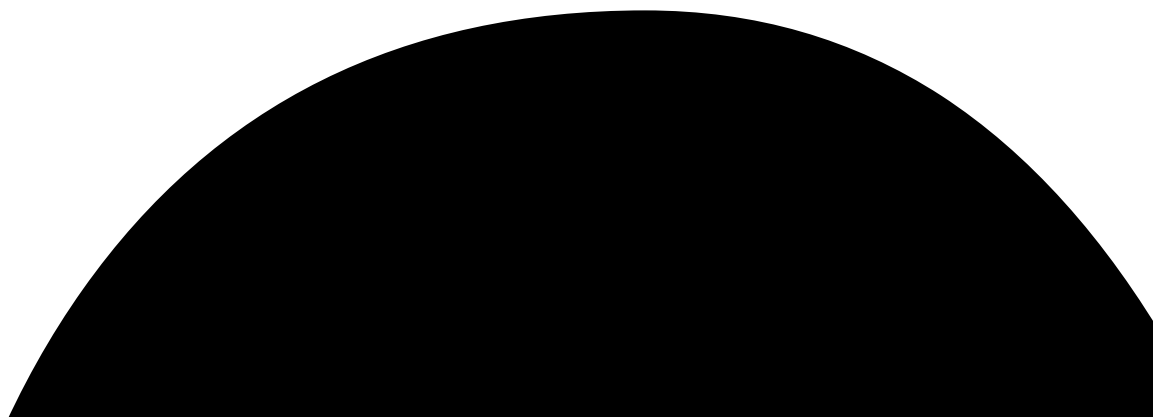














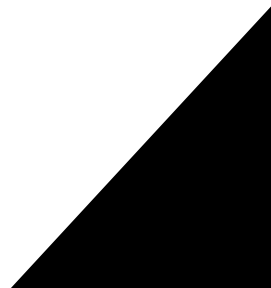












































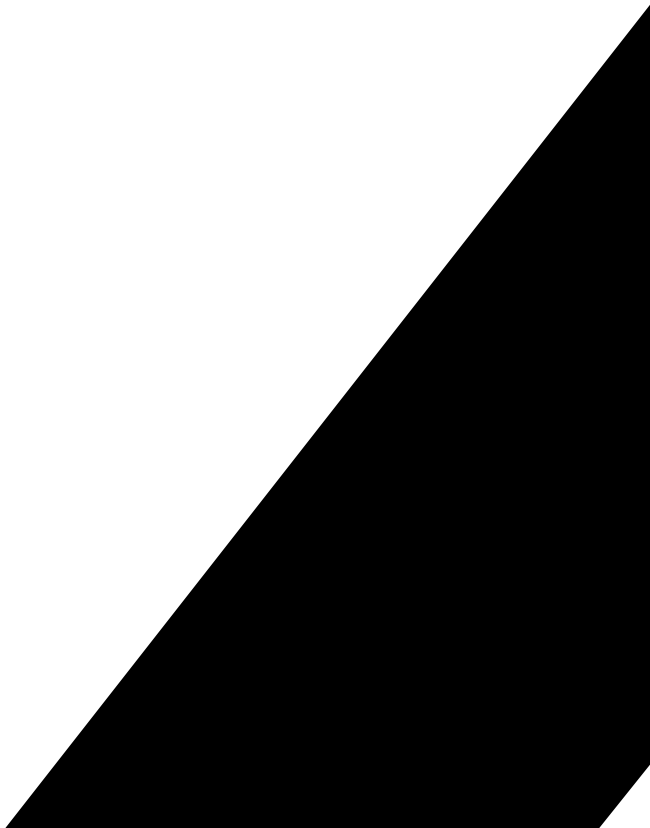
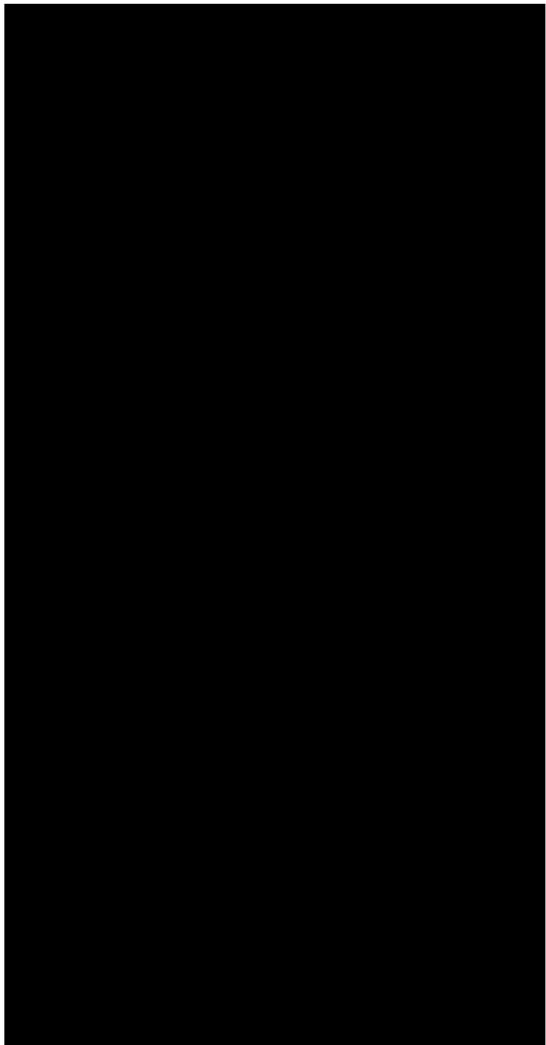




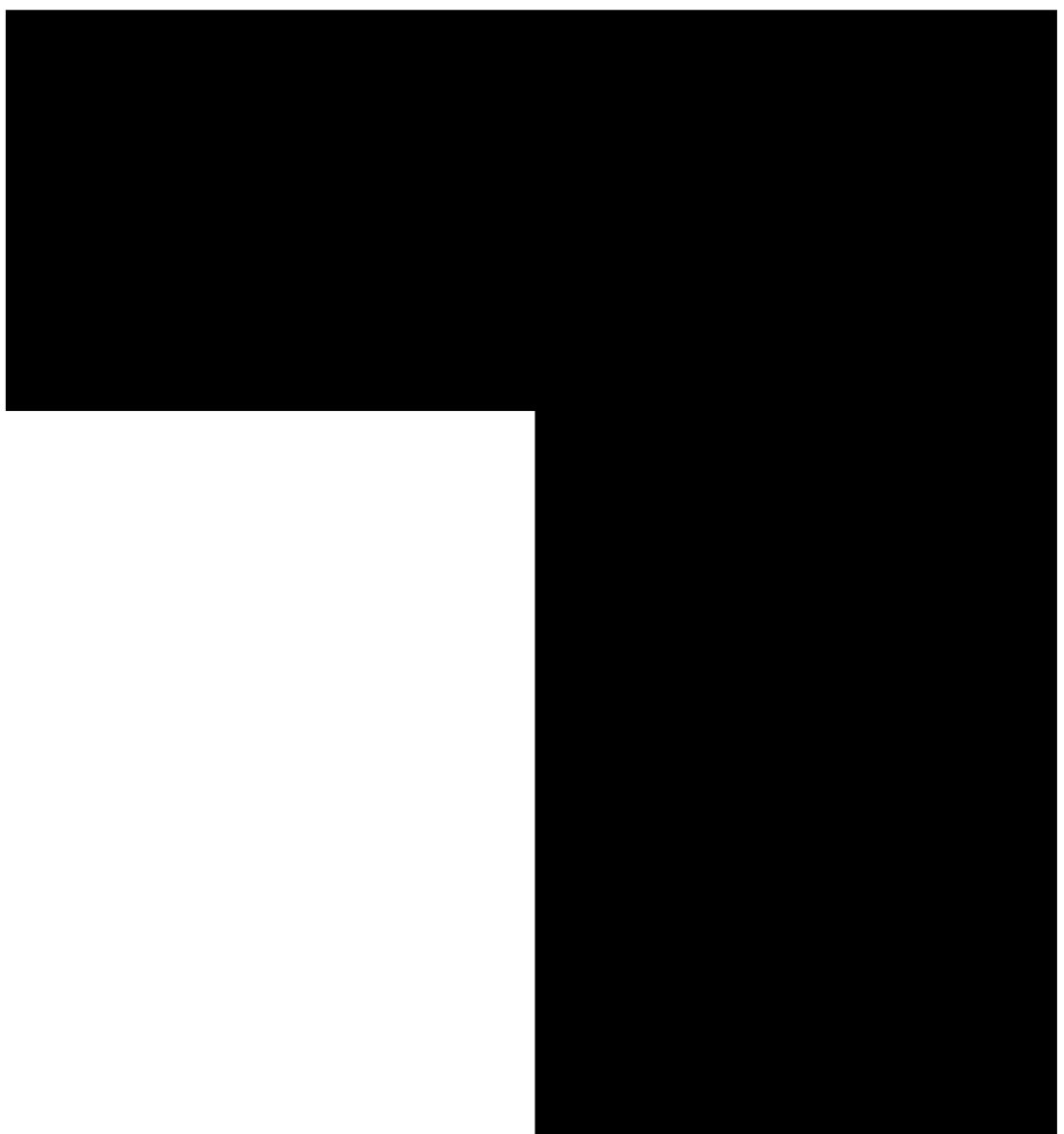










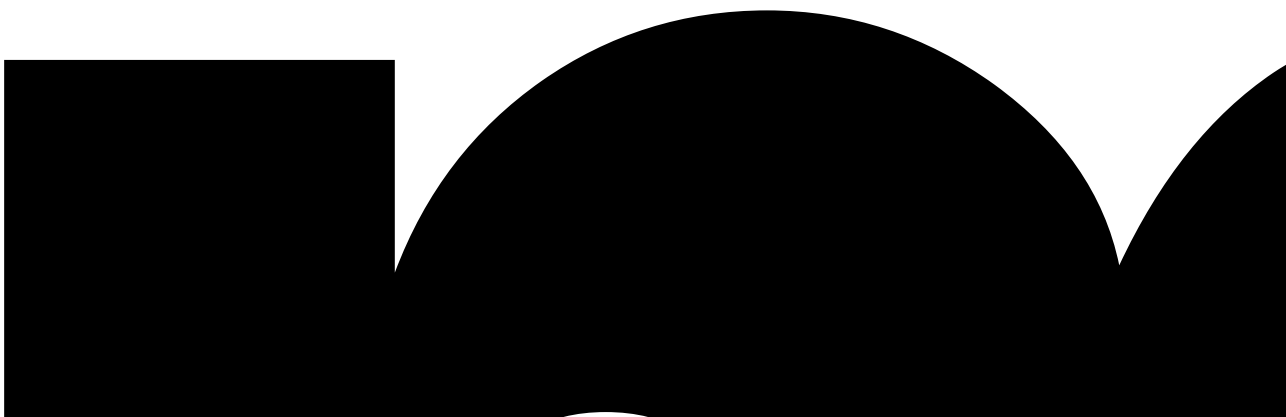




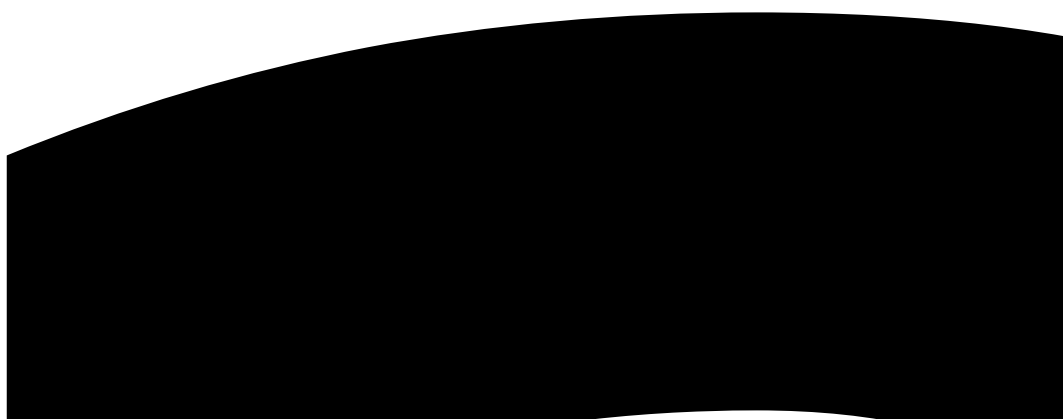




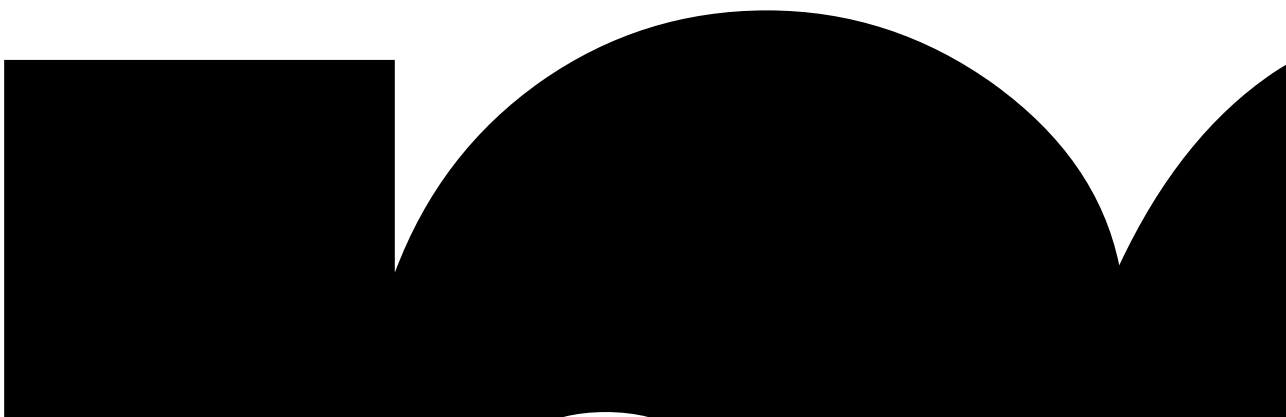










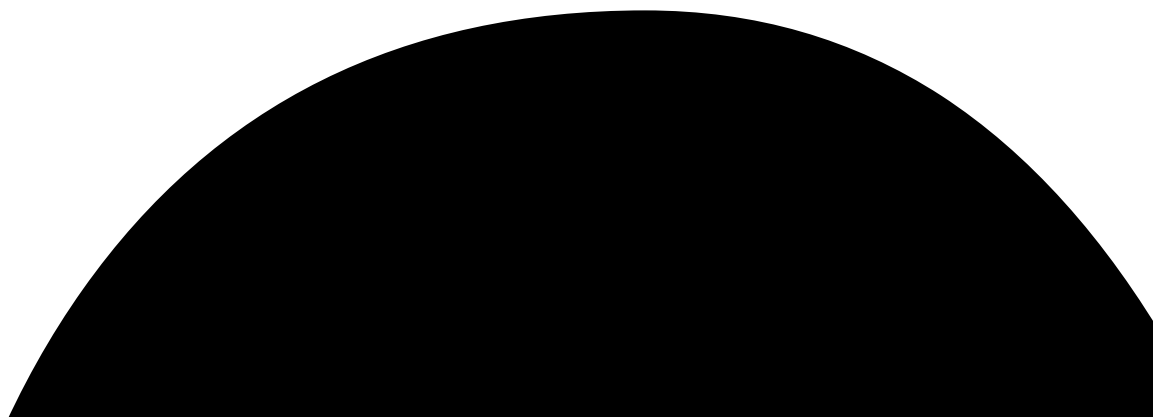














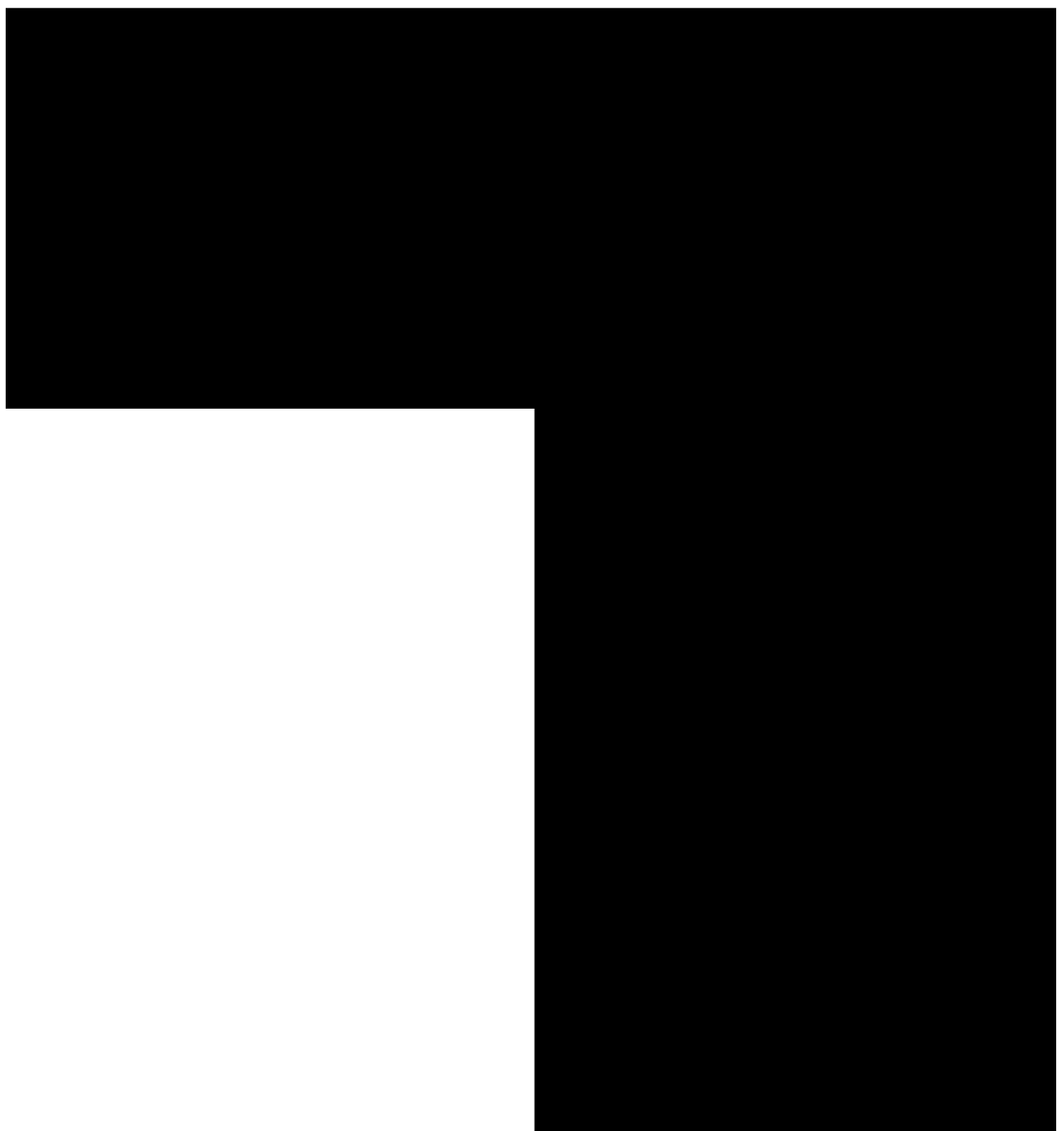






























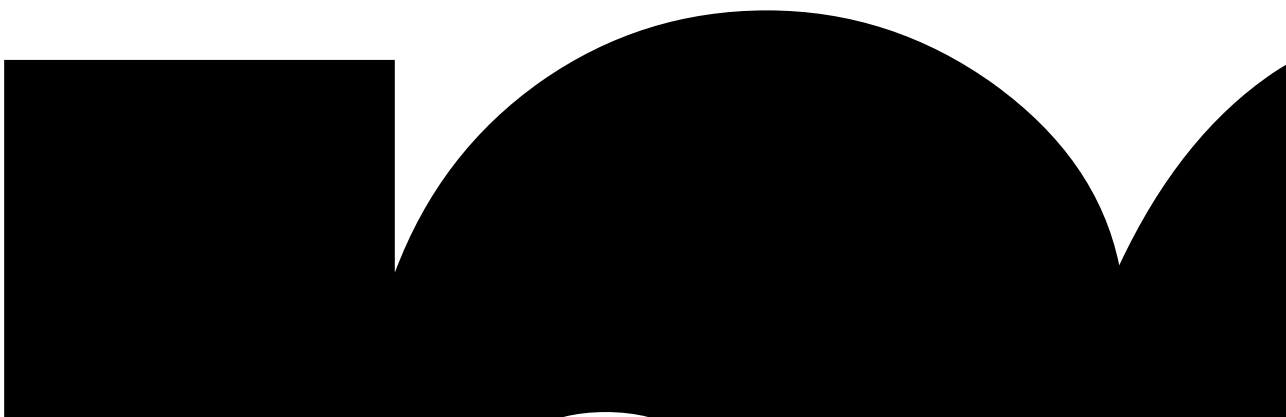






















































































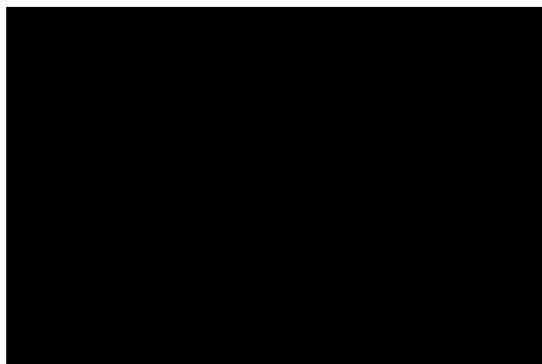






















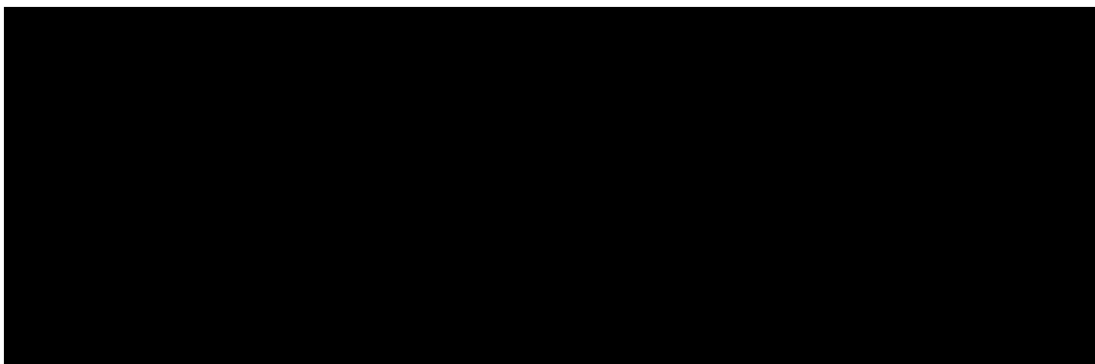










































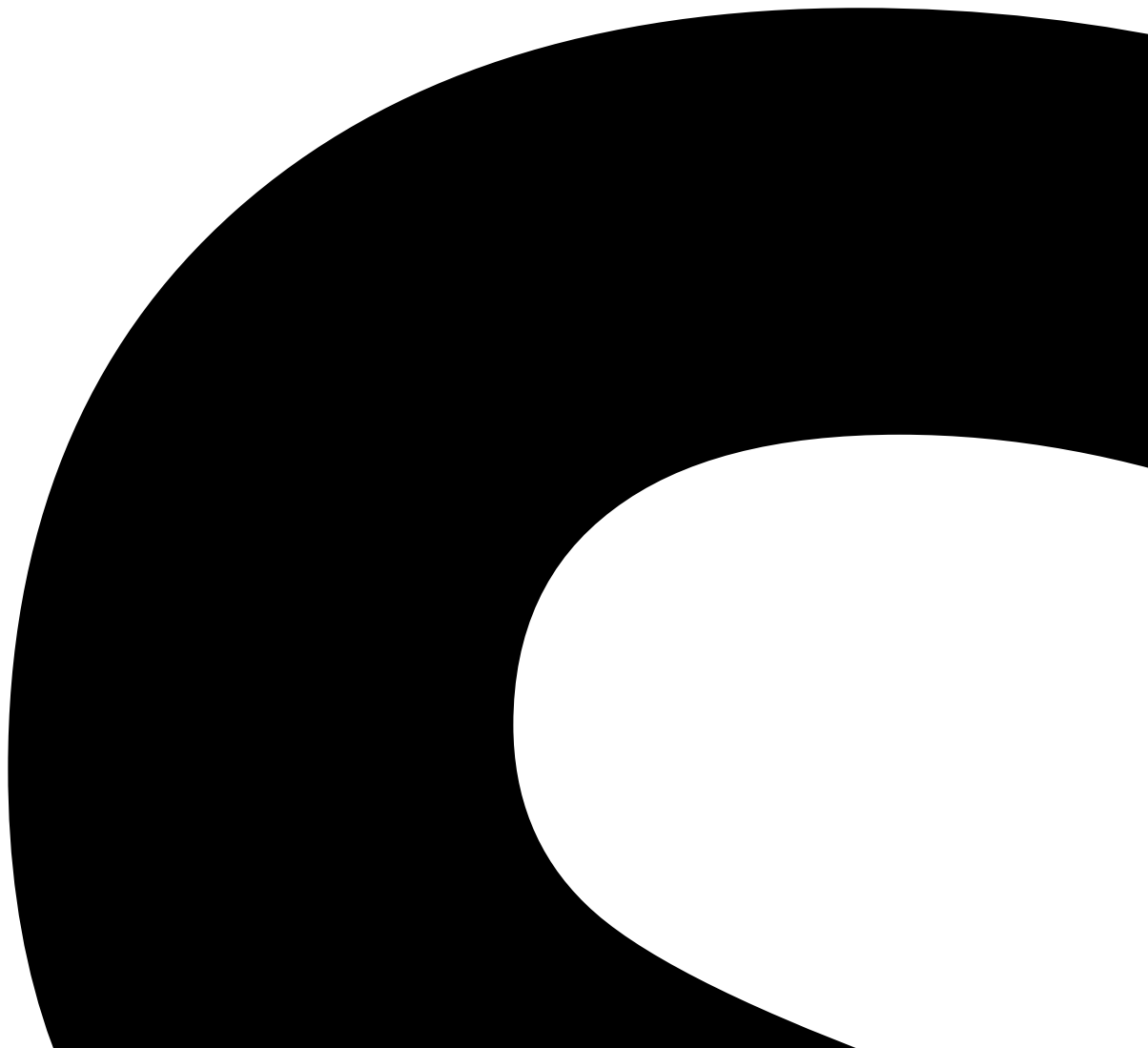


















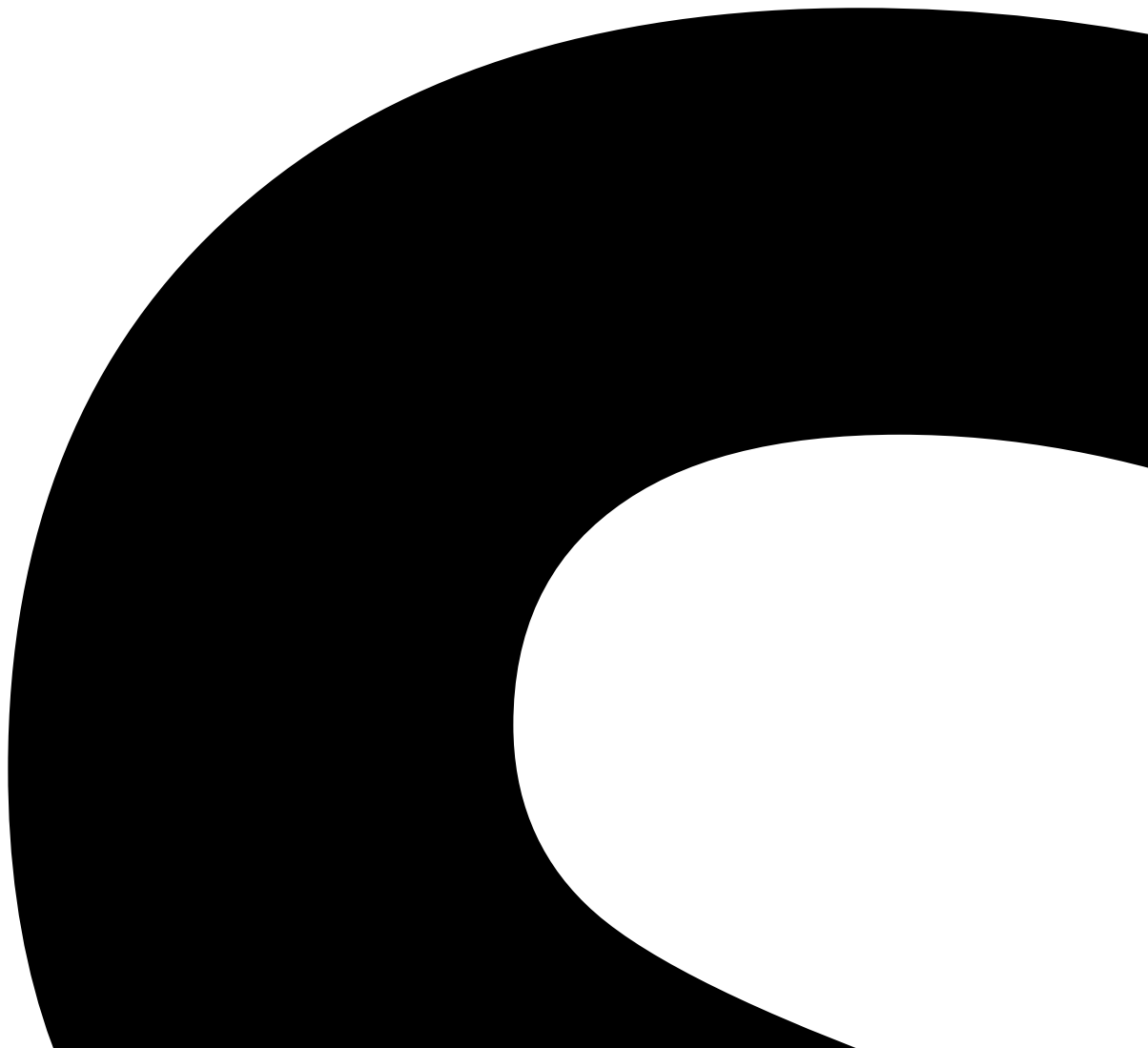












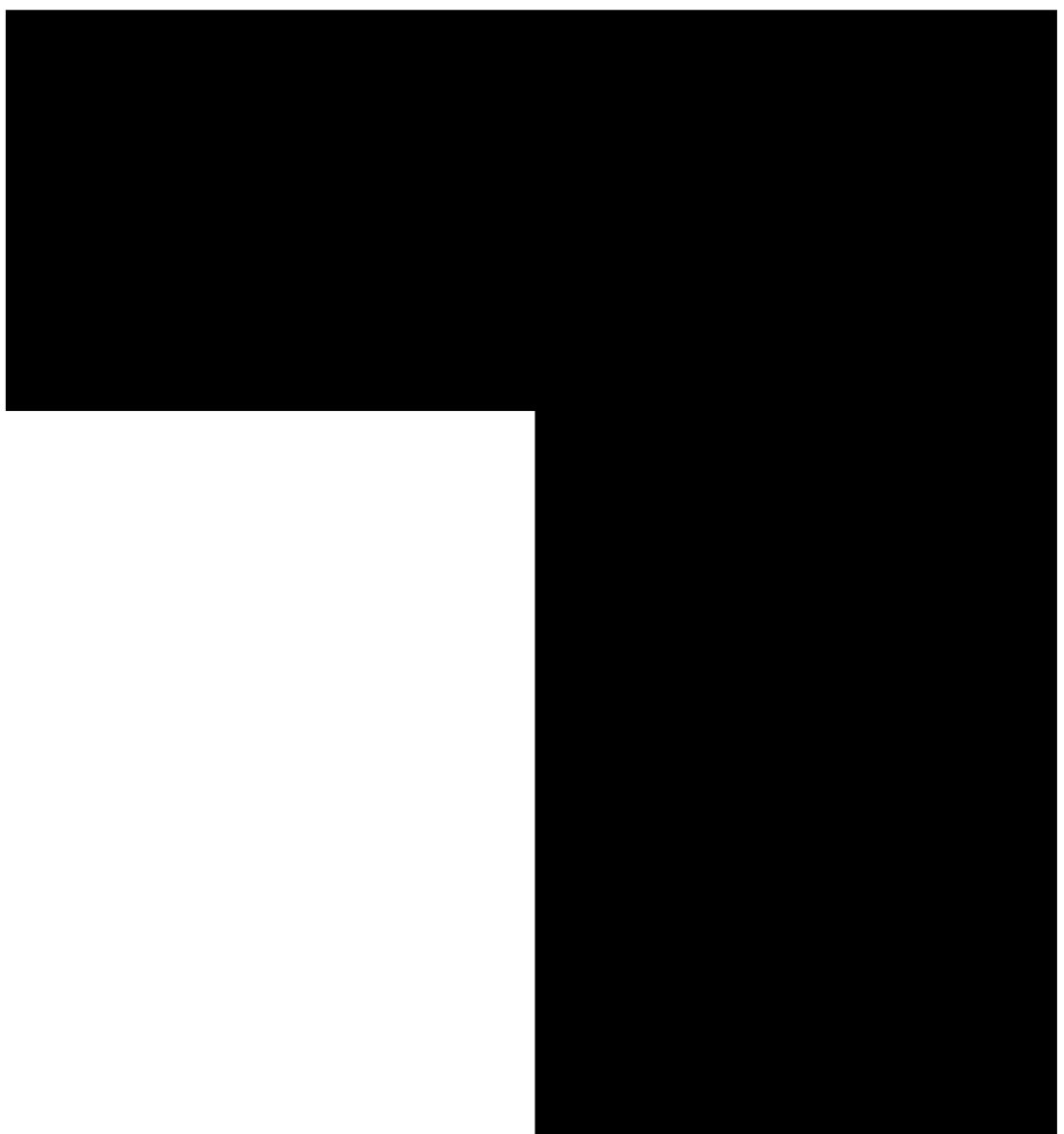






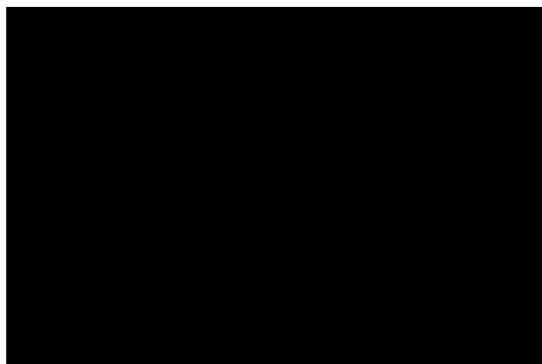


























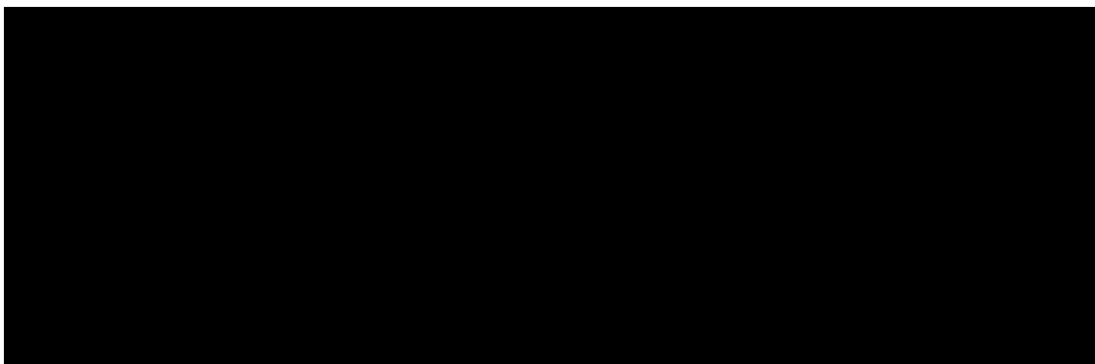














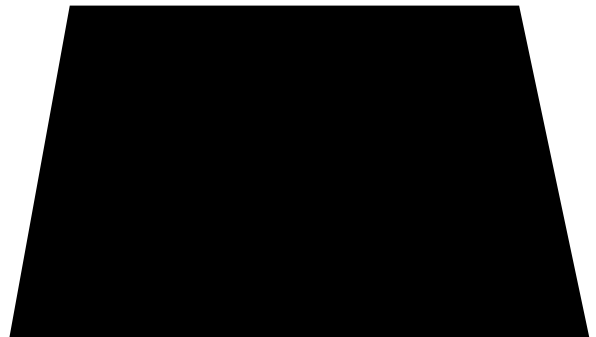
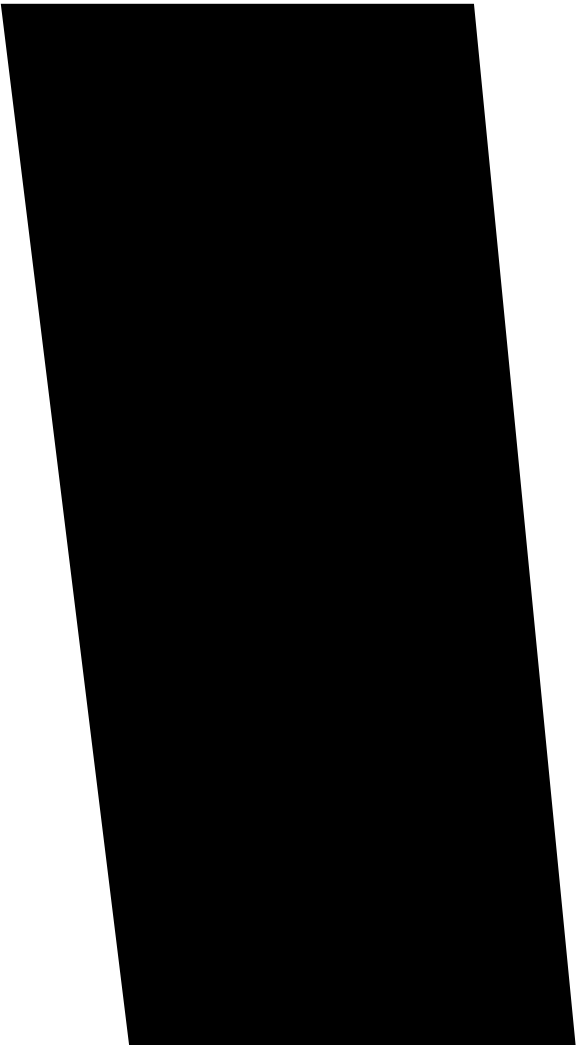








































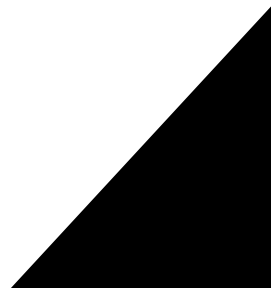










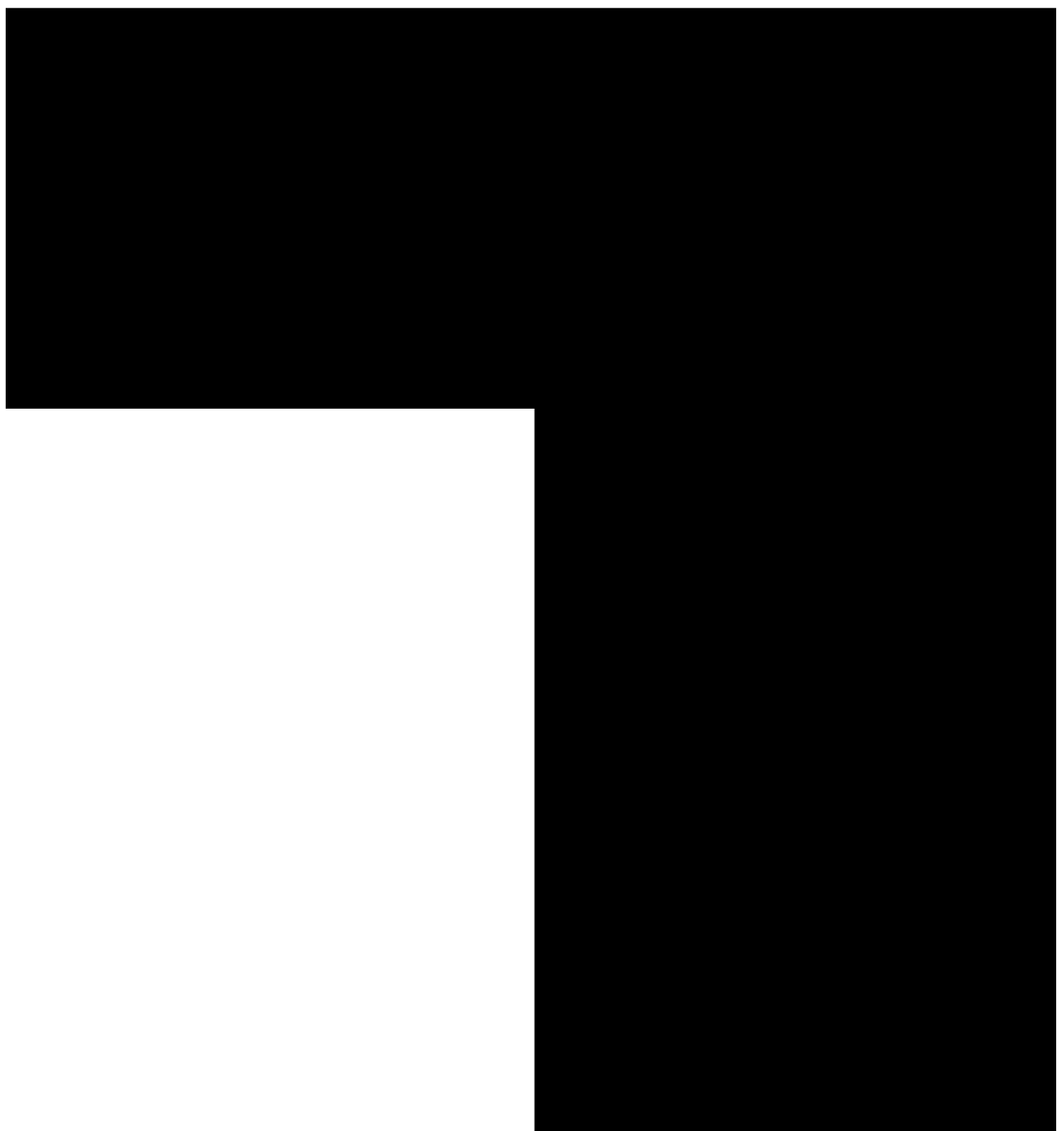












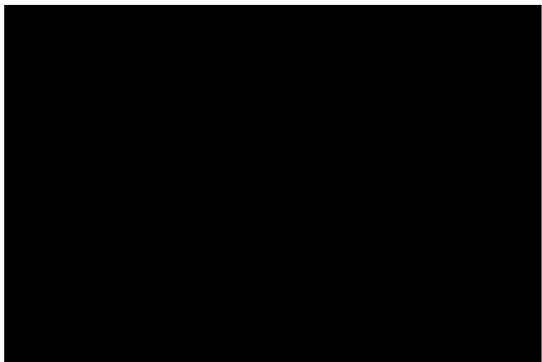


















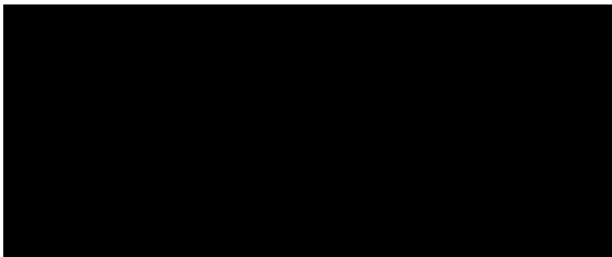












*"Langfristig können wir uns auf die Klimamodelle verlassen"*, sagt Marotzke. "Und diese sagen, dass die Erwärmung auf uns zukommt.". Solchen Leuten, die mit ähnlichen Prognosen aus der Wirtschaftswissenschaft an das Geld anderer Menschen kommen wollte, pflegte der Ökonom John Maynard Keynes zuzurufen: *"Langfristig sind wir alle tot."* Diese Prognose hat gegenüber allen anderen den Vorteil zu stimmen.  
Wir werden über diese letzten Verteidigungsversuche des J. Marotzke in Kürze berichten































