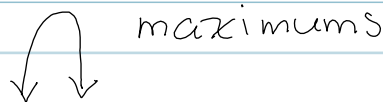
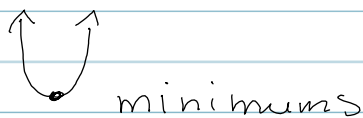
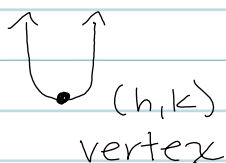


Section 4.3 Parabolas

$$y = x^2$$

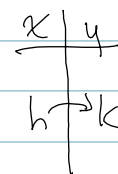


$$y = ax^2 + bx + c$$

general form
not readable

$$h = \frac{-b}{2a}$$

k = plug in the h
(to the original y)



$$y = a(x-h)^2 + k$$

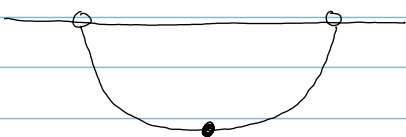
standard form "readable"
vertex = (h, k)

2 parts $|a| \Rightarrow$ sign & size

sign $a > 0$ (+) up
 $a < 0$ (-) down

size $|a|$
fraction $0 < |a| < 1$ compressed (wide)

$|a| = 1$



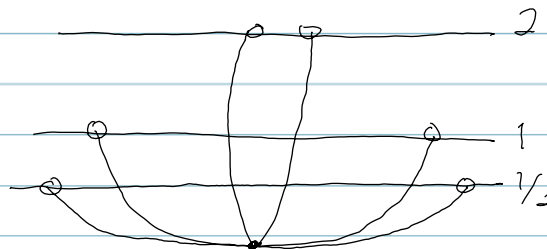
$|a| = 1$ neutral

$|a| > 1$ stretched (narrow)

$|a| = 2$



together



$|a| = 1/2$

1/2 compressed

$$\boxed{x\text{-int}} \quad y=0$$

$$0 = ax^2 + bx + c$$

(Quadratic Eqns)

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

(h,k) version of
the quadratic formula

$$x = h \pm \frac{\sqrt{-k}}{a}$$

ex.

$$\boxed{y = 3x^2 + 6x - 4}$$

basic
shape

$$y = x^2 \quad \uparrow \uparrow$$

$a=3 \quad b=6 \quad c=-4$

vertex

$$y = ax^2 + bx + c$$

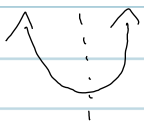
(general)

$$h = \frac{-b}{2a} = \frac{-6}{2(3)} = \frac{-6}{6} = -1$$

$$\begin{aligned} k &= 3(-1)^2 + 6(-1) - 4 \\ &= 3 - 6 - 4 \\ &= -7 \end{aligned}$$

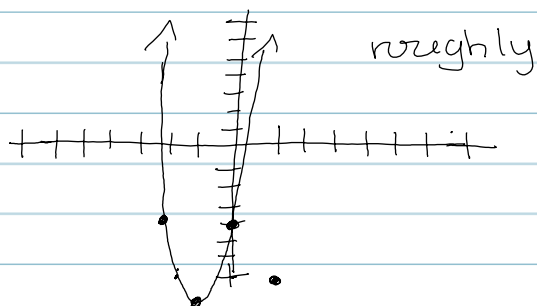
$a=3$ + up
3 stretched
(narrow)

axis of symmetry $x=h$



$$x = -1$$

x	y
-3	5
-2	-4
-1	-7
0	-4
1	5



x-int

$$x = h \pm \sqrt{\frac{-k}{a}}$$

$$-1 + 1.528$$

$$0.528$$

$$-1 - 1.528$$

$$-2.528$$

$$(h, k) = (-1, -7)$$

$$a = 3$$

$$x = -1 \pm \sqrt{\frac{-(-7)}{3}}$$

$$x = -1 \pm \sqrt{\frac{7}{3}}$$

Ex 2

$$y = \frac{-1}{2} (x-2)^2 + 4$$

basic shape: \cup $y = x^2$

vertex: standard

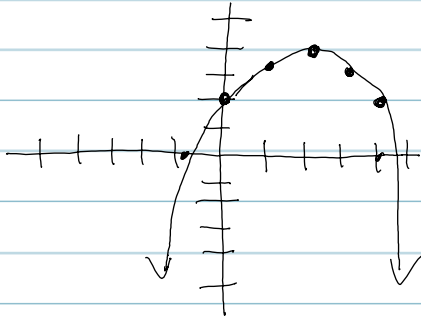
$$y = a(x-h)^2 + k$$
$$(2, 4)$$

a $a = -\frac{1}{2}$ - down

$\frac{1}{2}$ compressed
(wide)

axis of symmetry $x=h$
 $x=2$

x	y
0	2
1	$3\frac{1}{2}$
2	4
3	$3\frac{1}{2}$
4	2



D: \mathbb{R}
E: $(-\infty, 4]$

x_{int} (2, 4)

$$y=0 \quad a = -\frac{1}{2}$$

$$x = h \pm \sqrt{-\frac{k}{a}}$$

$$x = 2 \pm \sqrt{\frac{-4}{-\frac{1}{2}}}$$

$$x = 2 + 2.83$$

4.83

$$= 2 - 2.83$$

-0.83