
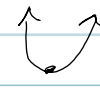

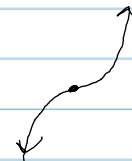


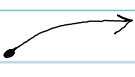
3.1 Graphing Equations

$$y = x$$


$$y = x^2$$


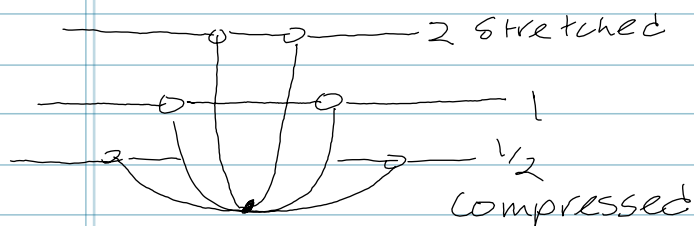
$$y = |x|$$





$$y = x^3$$


$$y = \sqrt{x}$$


Standard form


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



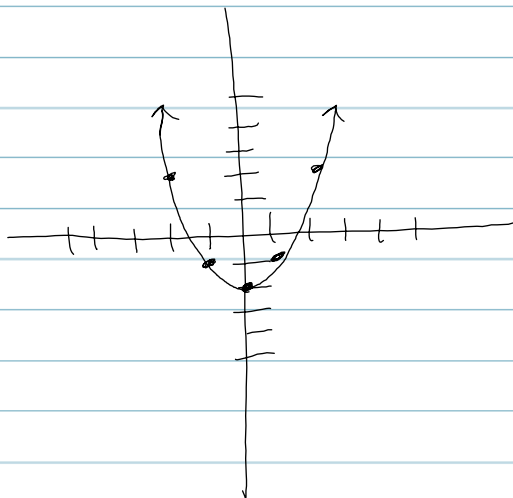
(h, k) = vertex 
 $|a|$ sign of a
 + up 
 - down 

size of a
 $|a|$ $0 < |a| < 1$ fraction
 compressed (wide)
 $a = 1$ neutral
 $|a| > 1$ stretched (narrow)

$$y = x^2 - 2$$

Shape: 

x	y
-2	2
-1	-1
0	-2
1	-1
2	2



$$\underline{y = a(x-h)^2 + k}$$

$$y = x^2 - 2$$

$$y = 1(x-0)^2 - 2 \quad (h, k) \quad (0, -2)$$

$$f = 3(x-1)^2 + 4$$

$$\begin{matrix} (h, k) & a & \text{up +} \\ (1, 4) & 3 & \text{stretched} \end{matrix}$$

$$f = -2(x+4)^2 - 2$$

(1 - (-4))

$$\begin{matrix} (h, k) & a & \text{down / stretched} \\ (-4, -2) & -2 & \end{matrix}$$

$$\begin{aligned} x+4 &= 0 \\ x &= -4 \end{aligned}$$

$$y = \frac{1}{2}(x+8)^2 - 12$$

$$\begin{matrix} (h, k) & a & \text{up} \\ (-8, -12) & \frac{1}{2} & \text{compressed} \end{matrix}$$

$$y = x^2 - 2$$

$$y = 1(x-0)^2 - 2$$

$$\begin{matrix} (h, k) & a & \text{up} \\ (0, -2) & 1 & \text{neutral} \end{matrix}$$

$$y = -x^2 + 3$$

$$y = -1(x-0)^2 + 3$$



shape $\hat{\cup}$

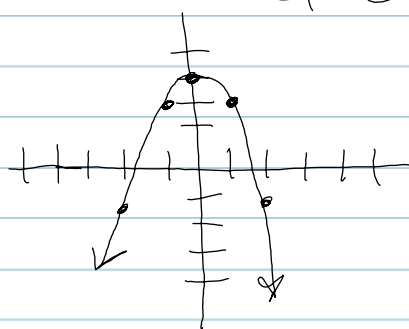
$$(h, k) \quad 0, 3$$

$$a = -1$$

- down

neutral

x	y
-2	-1
-1	2
0	3
1	2
2	-1



$$y = a|x-h| + k$$

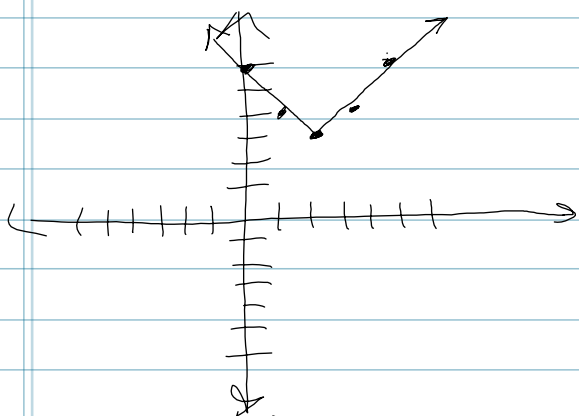
$$y = |x-2| + 3$$

Shape V ($y=|x|$)

(h, k) $x-2=0$ $(2, 3)$
 $x=2$

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

$a = 1$ up
neutral



$$y = |3-2| + 3$$

$$y = |1| + 3 = 4$$

$$y = |0-2| + 3$$

$$y = |-2| + 3 = 5$$

$$y = (x-h)^3 + k$$

$$y = (x-2)^3 + 1$$

Shape

x	y
0	0
2	1
3	2
4	4

$$y = (0-2)^3 + 1$$

$$= -8 + 1$$

$$= -7$$

(h, k) $(2, 1)$

$a = 1$ + uphill
neutral

$$y = (1-2)^3 + 1$$

$$(-1)^3 + 1$$

$$-1 + 1$$

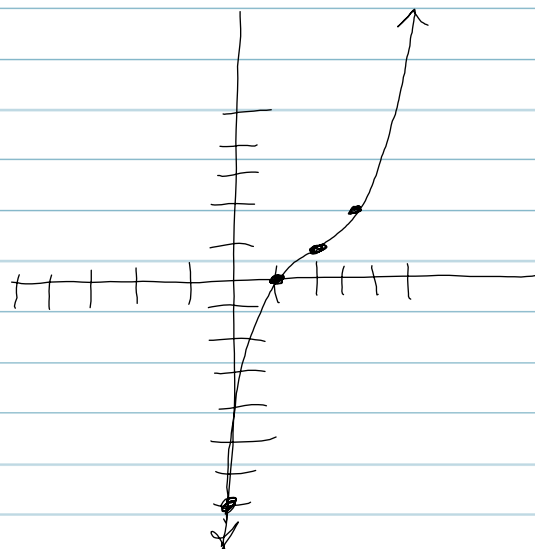
$$0$$

$$y = (3-2)^3 + 1$$

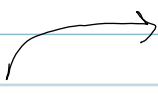
$$(1)^3 + 1$$

$$1 + 1$$

$$2$$



$$y = \sqrt{x-1} + 2$$

Shape 

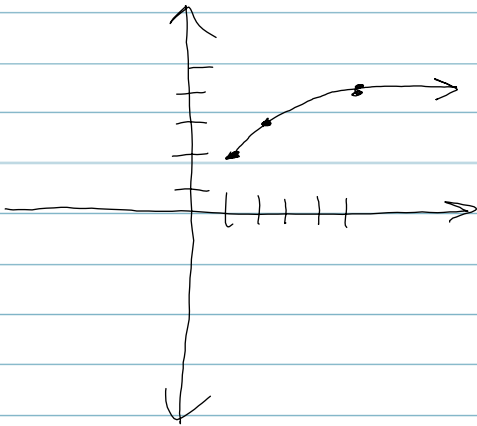
(h, k) $(1, 2)$

$a = 1$ up
neutral

x	y
0	
1	2
2	3
3	
4	
5	4

$$\frac{\sqrt{0-1} + 2}{-1 + 2}$$

$$\frac{\sqrt{2-1} + 2}{1 + 2} = 3$$



3.1
worksheets

~~scribbled out text~~

basic shape	h, k	a	up down +/-	width $ a $	final
-------------	--------	-----	-------------------	----------------	-------

$y = 2(x-3)^2 + 7$	$(3, 7)$	2	up	stretched	
$y = \frac{1}{2} x+3 -8$	$(-3, -8)$	$\frac{1}{2}$	up	compressed	
$y = -4(x+6)^3 - 4$	(h, k) $(6, -4)$	-4	down	stretched	
$y = \sqrt{x+1} - 3$	(h, k) $(-1, -3)$	1	up right	neutral	

+x → right
-x → left

$y = \sqrt{2-x} + 1$

$(2, 1)$ | up neutral $(2, 1)$
-x → L

$2-x=0$
+x +x
 $2=x$

$y = -\sqrt{x-2} + 3$

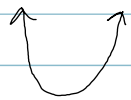
$(2, 3)$ | down neutral $(2, 3)$
+x → R

$y = -\sqrt{3-x} + 5$

$(3, 5)$ | down neutral $(3, 5)$
-x → L

$3-x=0$
 $3=x$

$$y = 3x^2 - 7$$



$(0, -7)$

3 up stretched

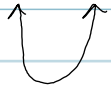
$$y = 3(x-0)^2 - 7$$



$(0, -7)$

$$y = -2(x+1)^2 + 3$$

basic shape



$(h, k) (-1, 3)$

a -2 - down

2 - stretched (narrow)

$3 - 2 \rightarrow 1$

$a - k \rightarrow$ next point

h	k
x	y
-3	-5
-2	1
-1	3
0	1
1	-5

$$-2(0+1)^2 + 3$$

$$-2(1)^2 + 3$$

$$-2 + 3 = 1$$

$$-2(-2+1)^2 + 3$$

$$-2(-1)^2 + 3$$

$$-2(1) + 3$$

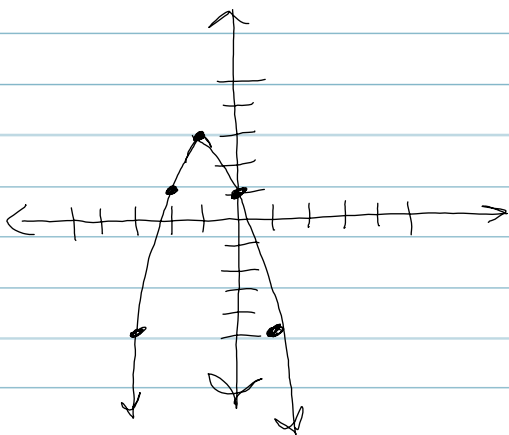
$$-2 + 3 = 1$$

$$-2(1+1)^2 + 3$$

$$-2(2)^2 + 3$$

$$-2(4) + 3$$

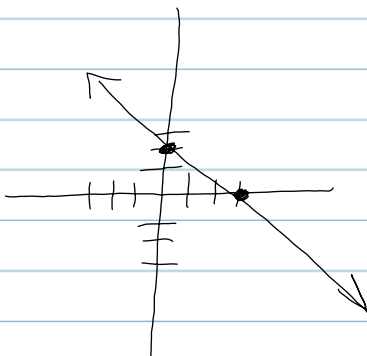
$$-8 + 3 = -5$$



$$y = x$$

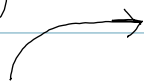
$$2x + 3y = 6$$

x	y
0	2
3	0



$$y = -\sqrt{2-x} + 1$$

shape:



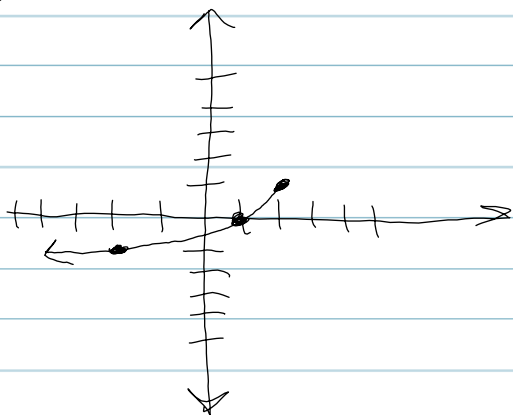
(h, k) (2, 1)

a -1 down
neutral

$-x \rightarrow$ Left

x	y
-2	-1
1	0
2	1

(2, 1)



$$y = -\sqrt{2-1} + 1$$

$$y = -\sqrt{1} + 1$$

$$y = -(1) + 1$$

$$y = 0$$

$$y = -\sqrt{2-(-2)} + 1$$

$$y = -\sqrt{4} + 1$$

$$y = -2 + 1$$

$$y = -1$$

$$f(x) = -2|x+2| + 4$$

Shape (h, k) a
 \nearrow $(-2, 4)$ -2 down
 stretched
 (narrow)

X	Y
0	0
-1	2
-2	4
-3	2
-4	0

$$-2|x+2| + 4$$

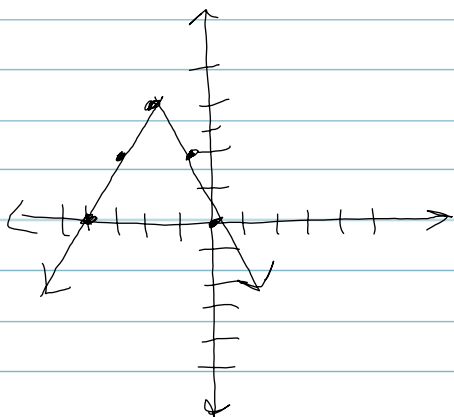
$$-2|1| + 4$$

$$-2 + 4 = 2$$

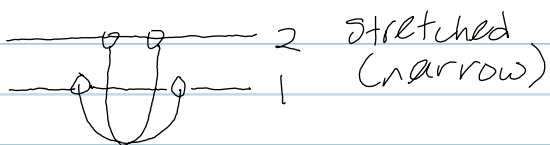
$$-2|0+2| + 4$$

$$-2|2| + 4$$

$$-4 + 4 = 0$$



* Vertical Functions



horizontal function

