

Math 110- 8.6 Notes

$$b=c=0$$

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

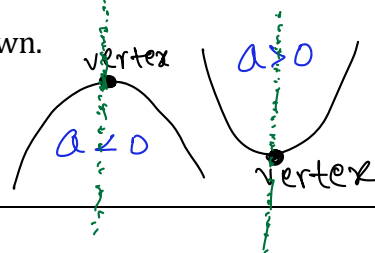
Graphing $y = ax^2$

Linear functions $y = mx + b$

↑ slope ↑ y-int.

Quadratic functions.

1. The Graph of $f(x) = ax^2$ is a parabola with vertex of $(0,0)$
2. The axis of symmetry is $x=0$
3. For $a > 0$ the parabola opens up, and for $a < 0$, the parabola opens down.
4. If $|a|$ is greater than 1, the parabola is narrower than $y = x^2$
5. If $|a|$ is less than 1, the parabola is wider than $y = x^2$



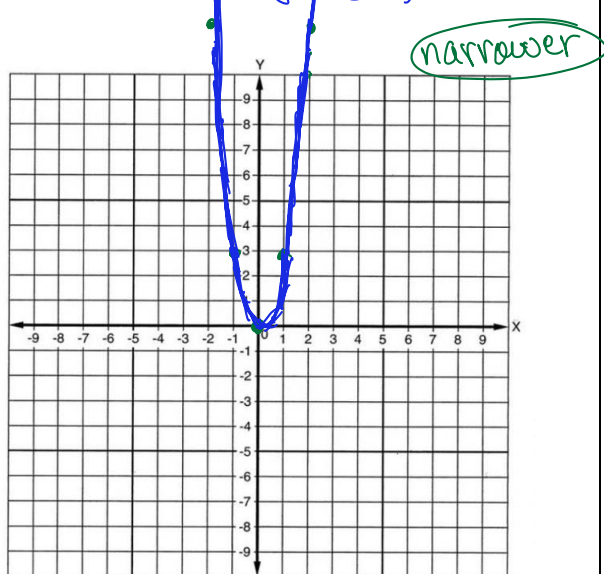
Graph: $f(x) = 3x^2$

1. Find Vertex

$$(0,0)$$

2. Create table (2 points less than, 2 points greater than vertex)

<u>x</u>	<u>y = f(x)</u>
1	$y = 3(1)^2 = 3$
2	$y = 3(2)^2 = 12$
-1	$y = 3(-1)^2 = 3$
-2	$y = 3(-2)^2 = 12$



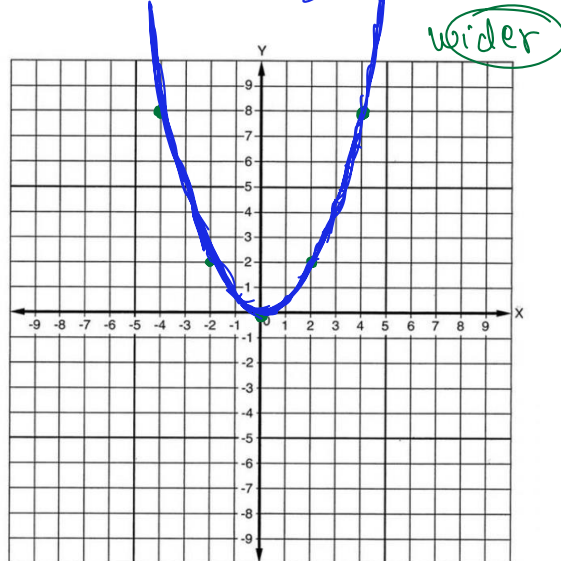
Graph: $f(x) = \frac{1}{2}x^2$

1. Find Vertex

$$(0,0)$$

2. Create table (2 points less than, 2 points greater than vertex)

<u>x</u>	<u>y = f(x)</u>
2	$\frac{1}{2}(2)^2 = 2$
4	$\frac{1}{2}(4)^2 = 8$
-2	$\frac{1}{2}(-2)^2 = 2$
-4	$\frac{1}{2}(-4)^2 = 8$



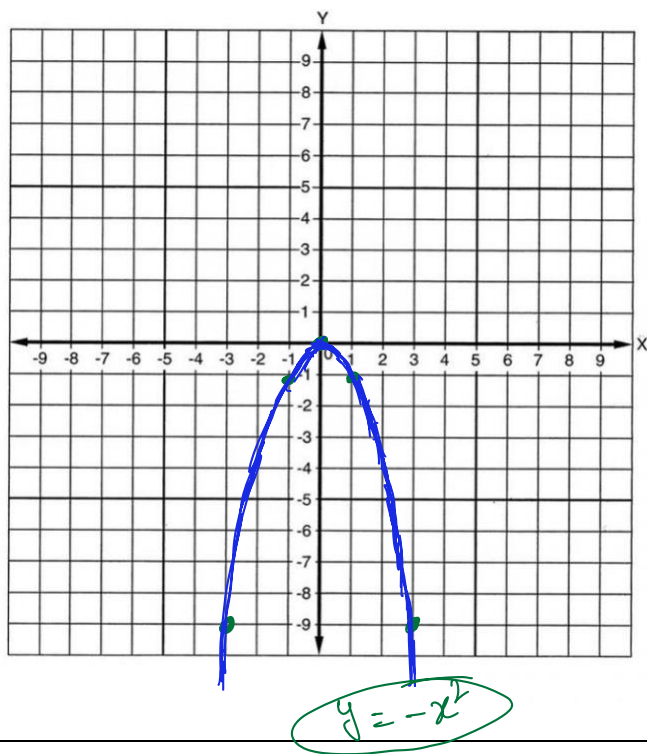
Graph: $f(x) = -x^2$

1. Find Vertex

$$(0, 0)$$

2. Create table (2 points less than, 2 points greater than vertex)

<u>x</u>	<u>y</u>
1	$-(1)^2 = -1$
3	$-(3)^2 = -9$
-1	$-(-1)^2 = -1$
-3	$-(-3)^2 = -9$



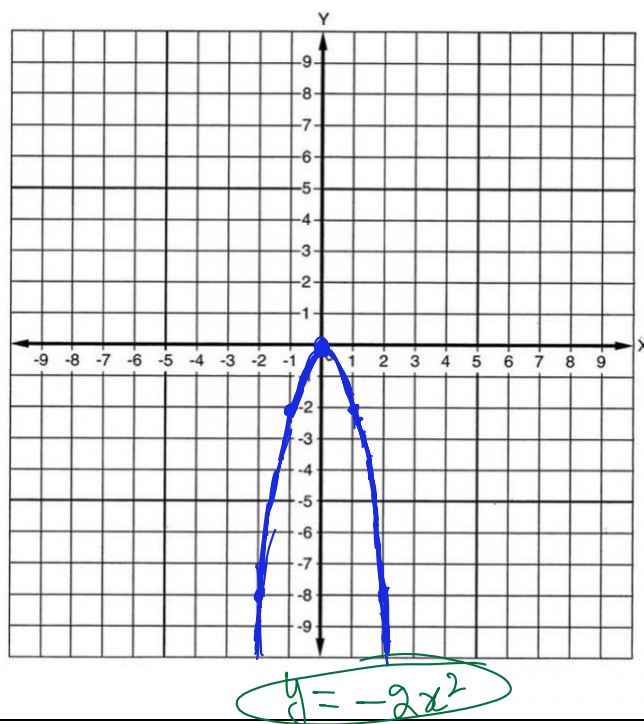
Graph: $f(x) = -2x^2$

1. Find Vertex

$$(0, 0)$$

2. Create table (2 points less than, 2 points greater than vertex)

<u>x</u>	<u>y</u>
1	$-2(1)^2 = -2$
2	$-2(2)^2 = -8$
-1	$-2(-1)^2 = -2$
-2	$-2(-2)^2 = -8$



Graphing $y = a(x - h)^2$

1. The Graph of $f(x) = a(x - h)^2$ is a parabola with vertex of $(h,0)$
2. The axis of symmetry is $x=h$
3. If h positive, the graph of $y = ax^2$ is shifted h units to the right
4. If h negative, the graph of $y = ax^2$ is shifted $|h|$ units to the left
5. The vertex is $(h,0)$, and the axis of symmetry is $x=h$

vertex on any arbitrary point on x-axis depending on h .

Graph: $f(x) = \frac{1}{2}(x - 2)^2$

$x - h = x - 2$

$h = 2$

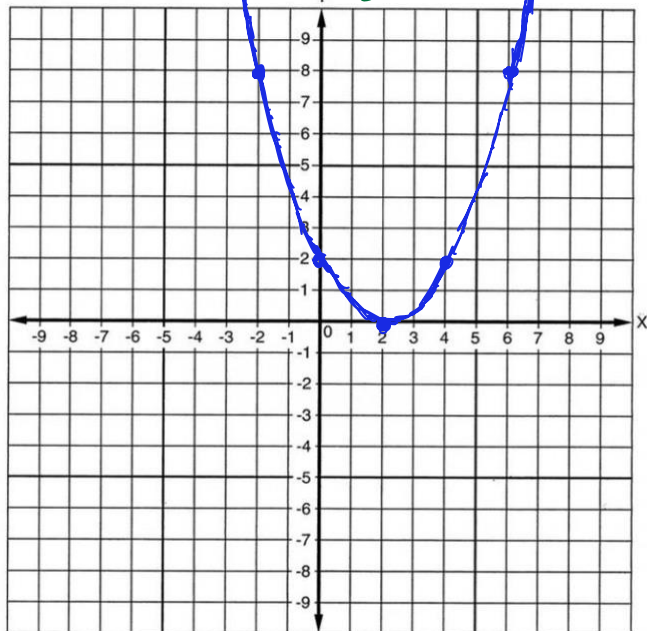
1. Find Vertex

$(2, 0)$

2. Create table (2 points less than, 2 points greater than vertex)

<u>x</u>	<u>y</u>
4	$\frac{1}{2}(4-2)^2 = 2$
6	$\frac{1}{2}(6-2)^2 = 8$
0	$\frac{1}{2}(0-2)^2 = 2$
-2	$\frac{1}{2}(-2-2)^2 = 8$

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



Graph: $f(x) = 2(x - 4)^2$

$x - h = x - 4$

$\Rightarrow h = 4$

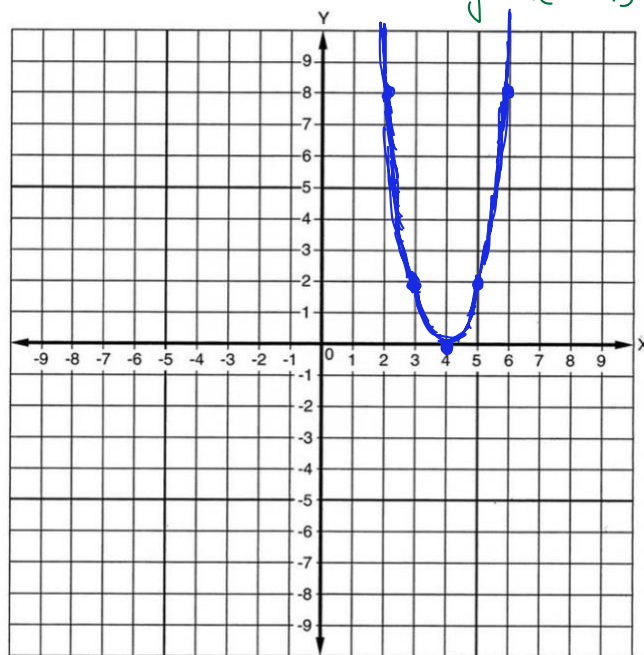
1. Find Vertex

$(4, 0)$

2. Create table (2 points less than, 2 points greater than vertex)

<u>x</u>	<u>y</u>
5	$2(5-4)^2 = 2$
6	$2(6-4)^2 = 8$
3	$2(3-4)^2 = 2$
2	$2(2-4)^2 = 8$

$y = 2(x-4)^2$



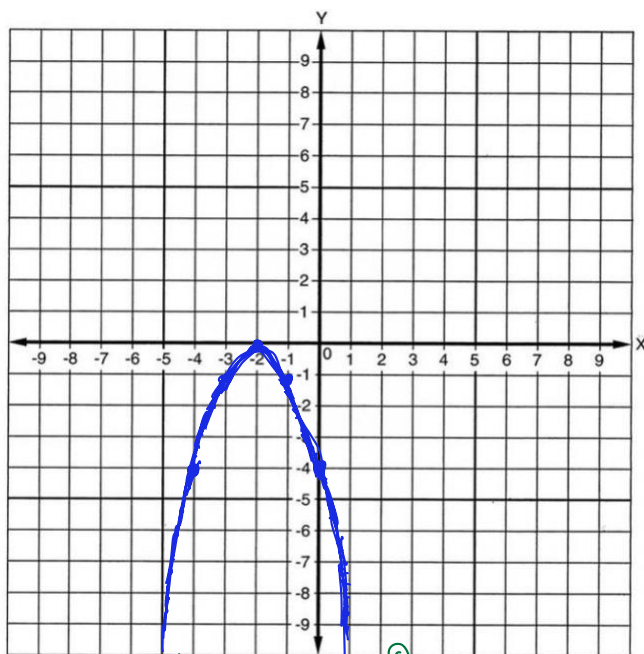
Graph: $f(x) = -(x + 2)^2$

1. Find Vertex

$$(-2, 0)$$

2. Create table (2 points less than, 2 points greater than vertex)

<u>x</u>	<u>y</u>
-1	$-(-1+2)^2 = -1$
0	$-(0+2)^2 = -4$
-3	$-(-3+2)^2 = -1$
-4	$-(-4+2)^2 = -4$



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

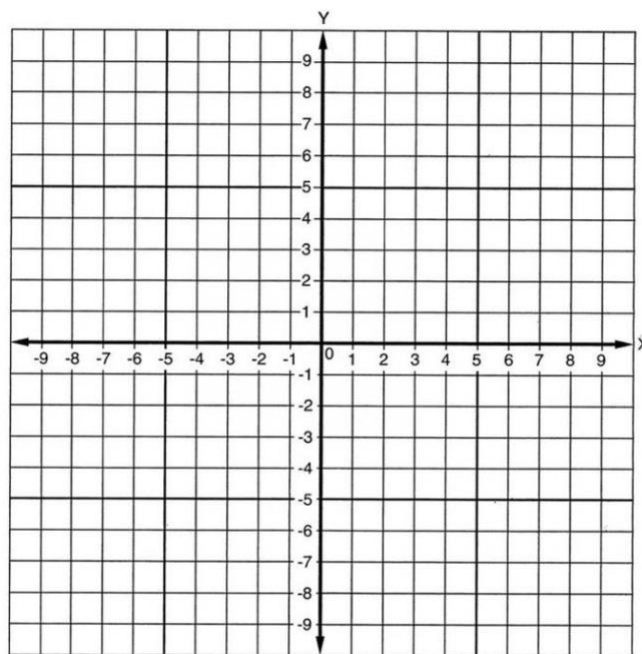
Graph: $f(x) = -(x + 1)^2$

hw.

1. Find Vertex

$$(-1, 0)$$

2. Create table (2 points less than, 2 points greater than vertex)



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

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

$$\underline{\underline{Ex}} \quad \underline{\underline{y = x^2 - x + 2}}$$

1. The Graph of $f(x) = a(x - h)^2 + k$ is a parabola with vertex of (h, k)
2. The axis of symmetry is $x = h$
3. If k is positive, the graph of $y = a(x - h)^2$ is shifted k units to the ~~right~~ ^{up}
4. If k negative, the graph of $y = a(x - h)^2$ is shifted $|k|$ units to the ~~left~~ ^{down}
5. The vertex is (h, k) , and the axis of symmetry is $x = h$
6. For $a > 0$, the minimum function value, and for $a < 0$, the maximum function value is k .
opens upwards *opens downwards.*

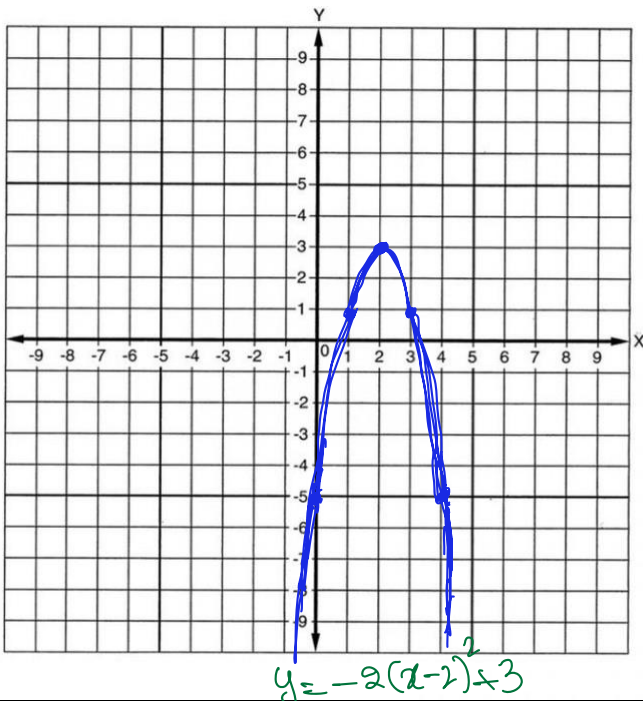
Graph: $f(x) = -2(x - 2)^2 + 3$

1. Find Vertex

$$(2, 3)$$

2. Create table (2 points less than, 2 points greater than vertex)

<u>x</u>	<u>y</u>
3	$-2(3-2)^2 + 3 = 1$
4	$-2(4-2)^2 + 3 = -5$
1	$-2(1-2)^2 + 3 = 1$
0	$-2(0-2)^2 + 3 = -5$



Graph: $f(x) = -(x - 1)^2 + 2$

1. Find Vertex

$$(1, 2)$$

2. Create table (2 points less than, 2 points greater than vertex)

<u>x</u>	<u>y</u>
2	$-(2-1)^2 + 2 = 1$
3	$-(3-1)^2 + 2 = -2$
0	$-(0-1)^2 + 2 = 1$
-1	$-(-1-1)^2 + 2 = -2$

