

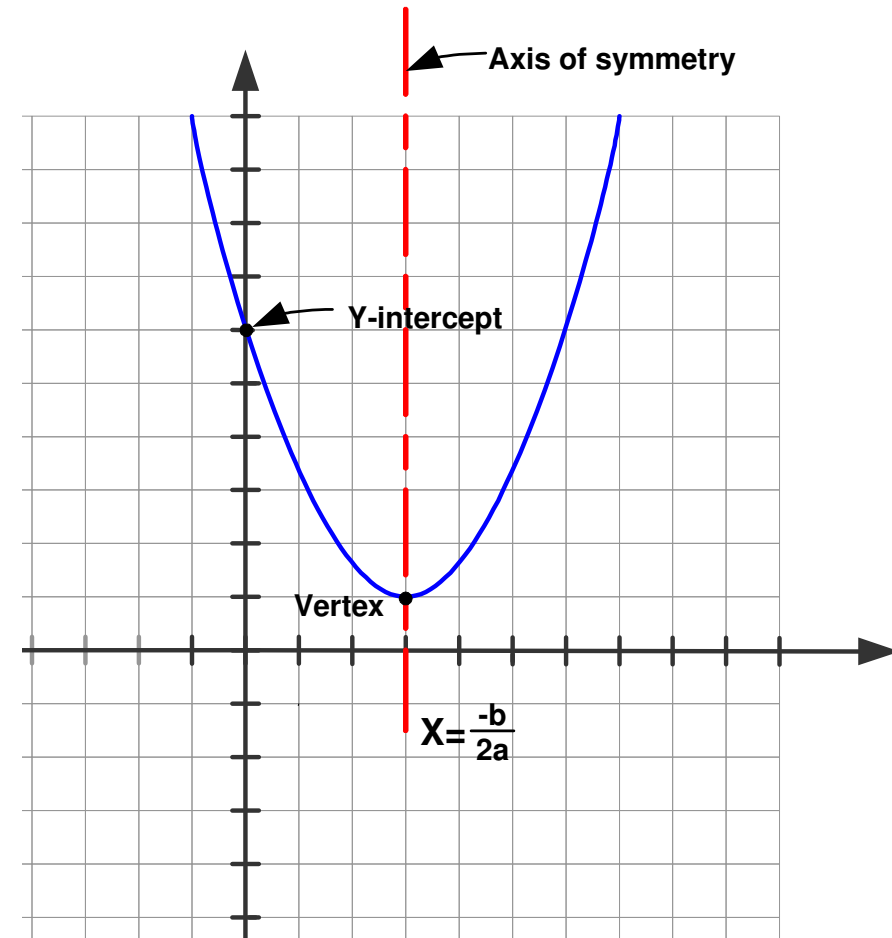
Sketching Parabolas

What does the equation tell me?

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

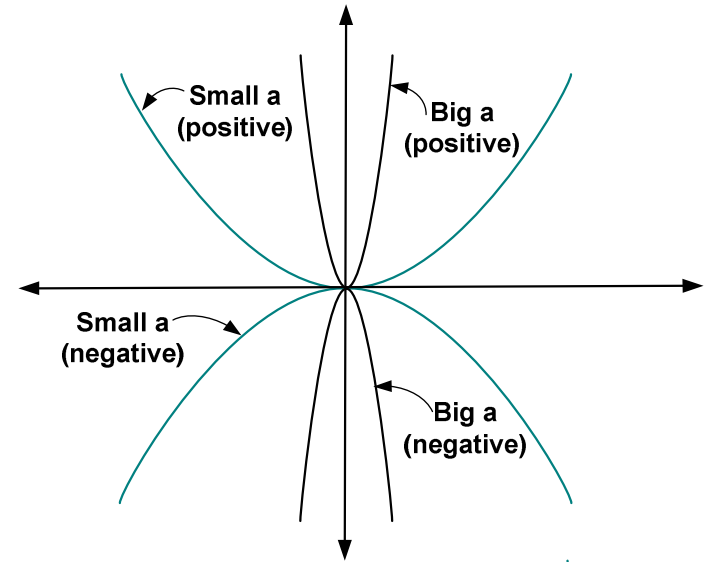
x^2 says it is a Parabola.

- If a is positive, the parabola goes up (smiling)
- If a is negative, the parabola goes down (frowning)
- The vertex has an x coordinate of $\frac{-b}{2a}$
- y coordinate: plug in $\frac{-b}{2a}$
- into original equation, solve for y
- Axis of symmetry is the line $x = \frac{-b}{2a}$
- y -intercept is c (or plug in an easy value)

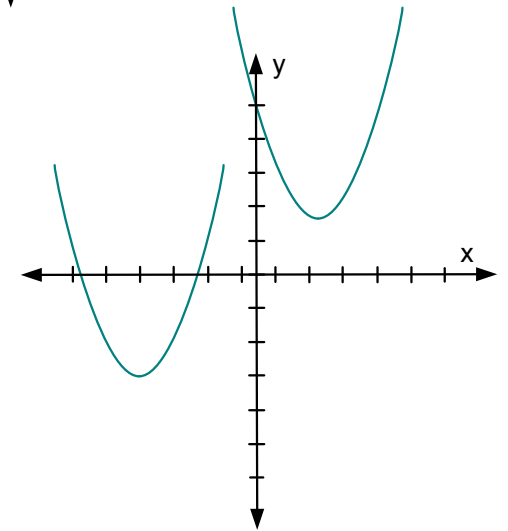


Changing Coefficients

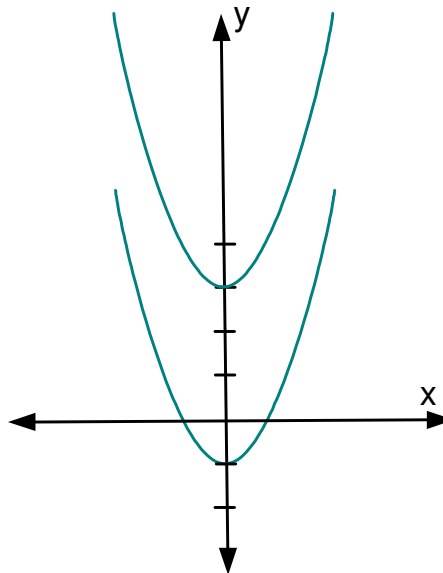
"a" changes the flatness of the dish.

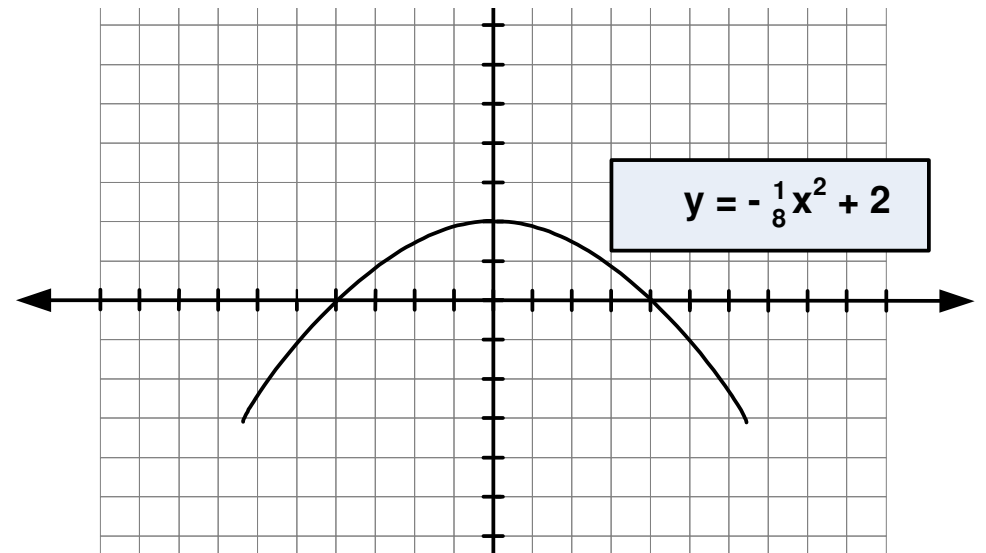
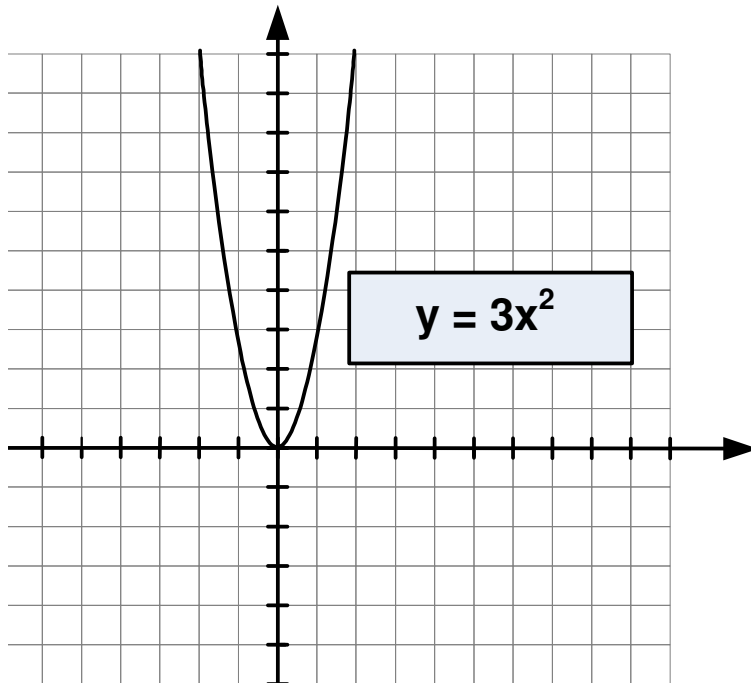
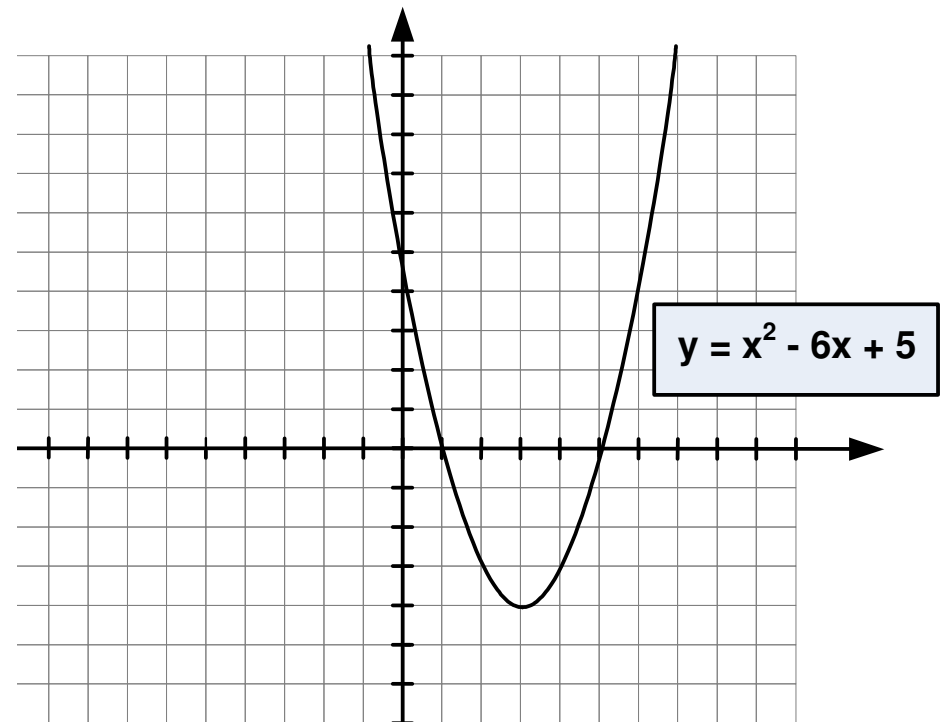
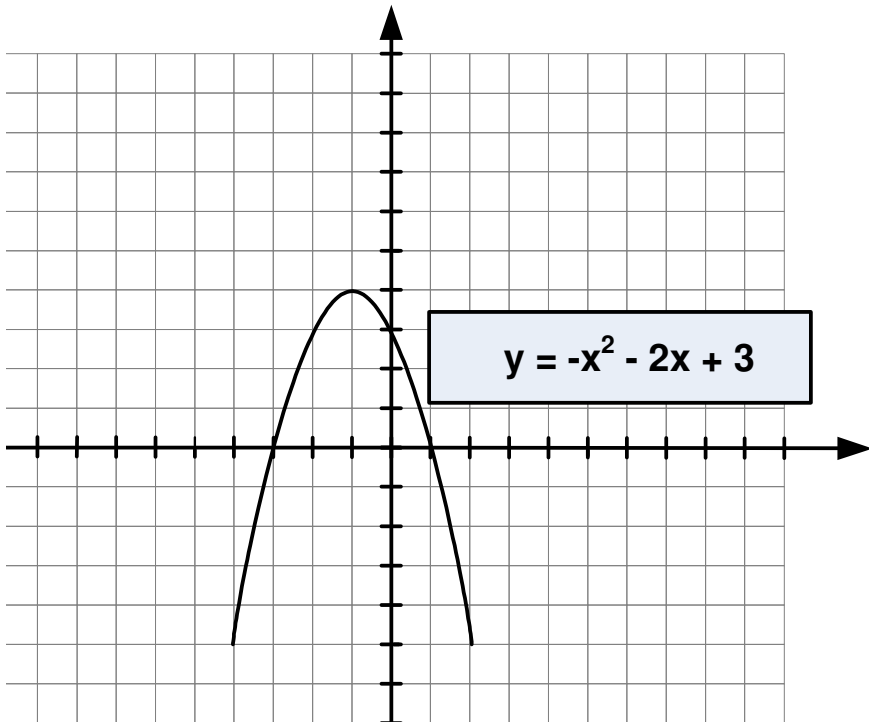


"b" moves the x coordinate of the vertex per $\frac{-b}{2a}$



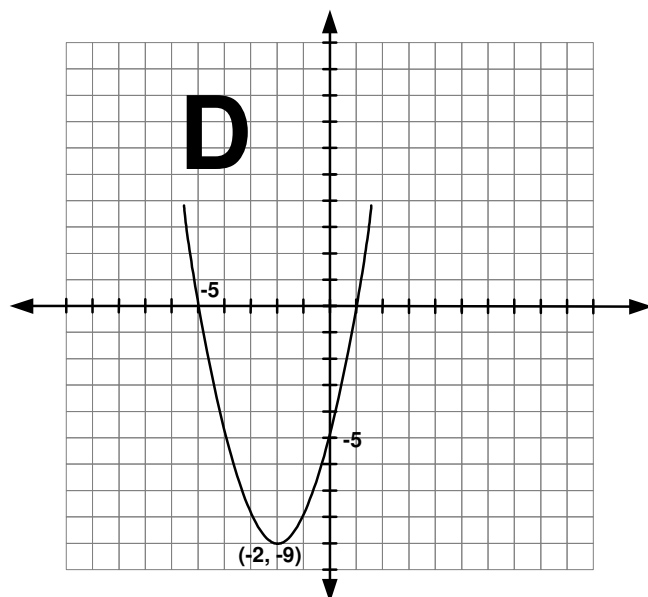
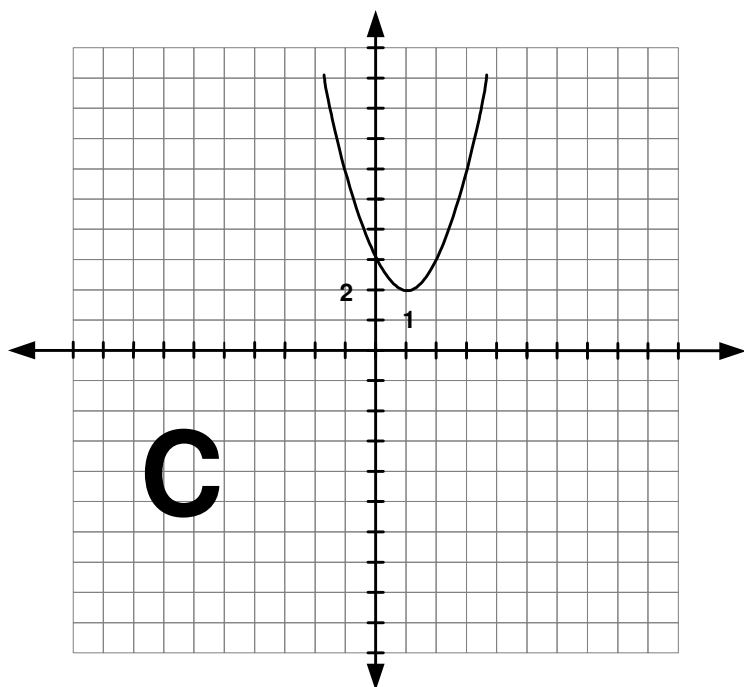
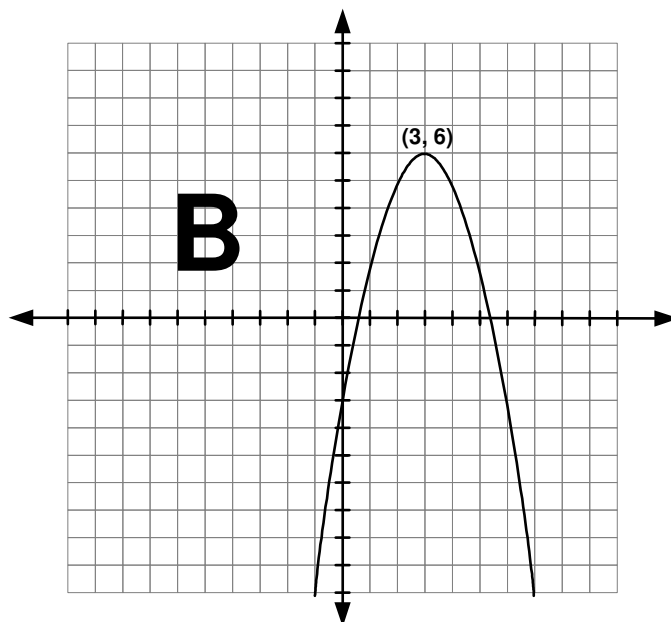
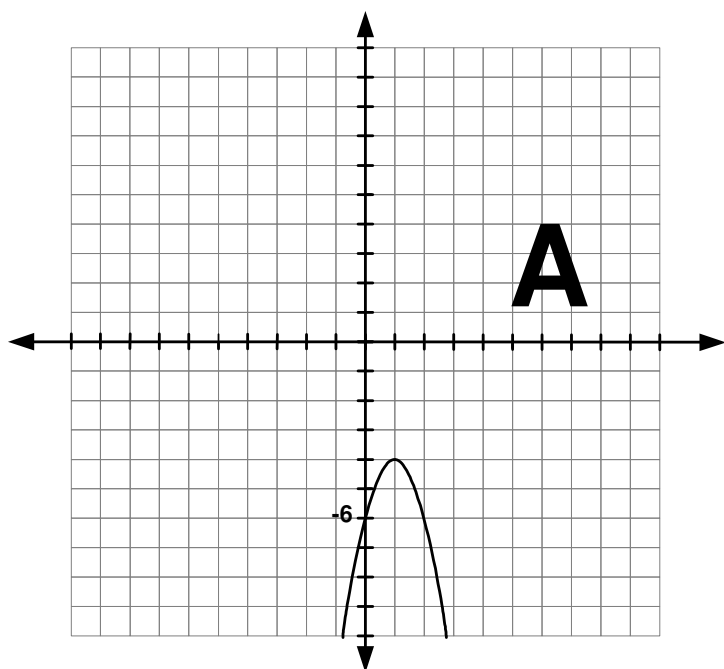
"c" is the y-intercept





Match the equation with its graph.

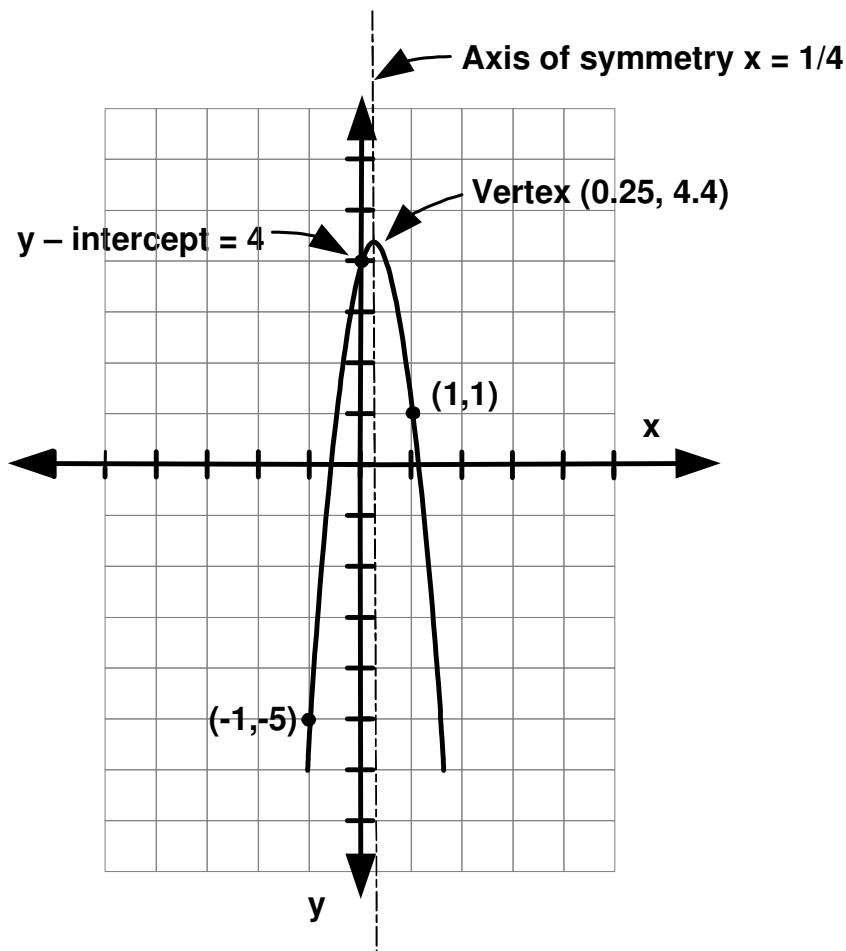
1. $y = -x^2 + 6x - 3$
2. $y = -2x^2 + 4x + 8$
3. $y = x^2 - 2x + 3$
4. $y = -x^2 + 4x - 6$
5. $y = x^2 + 4x - 5$
6. $y = -2x^2 + 4x - 5$
7. $y = x^2 + 2x + 6$



Graph $y = -6x^2 + 3x + 4$

- X^2 shows that this is a parabola where $a = -6$, $b = 3$, $c = 4$
- $-a$ (-6) shows that it opens "down" (frown)
- Axis of symmetry is $x = -\frac{b}{2a}$ or $x = -\frac{3}{2(-6)}$
- Vertex – plug-in x value (from axis of symmetry) to get y :
 $y = -6(.25)^2 + 3(.25) + 4 = -.375 + .75 + 4 = 4.375$
 or Vertex = $(.25, 4.375)$

	x	y
• y intercept = $c = 4$		
• Select a couple more values of x	0.25	4.375
	0	4 (vertex)
	1	1 (y-intercept)
	-1	-5

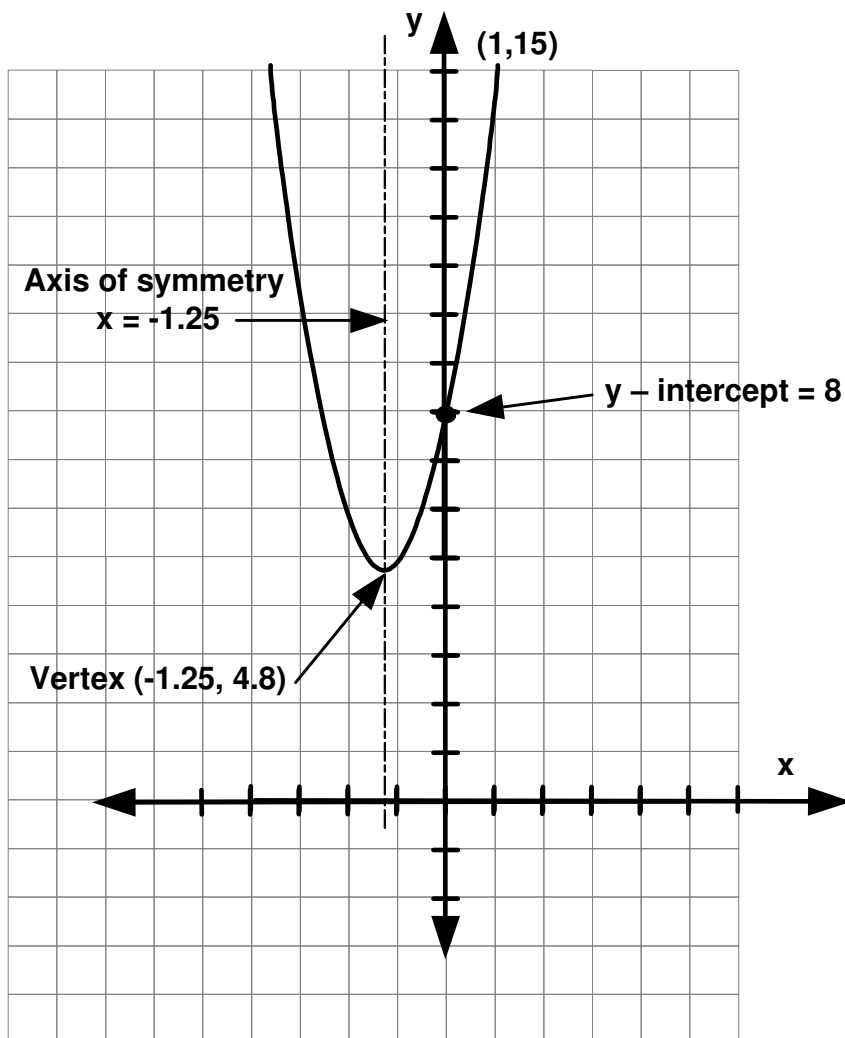


Graph $y = 2x^2 + 5x + 8$

- X^2 shows that this is a parabola where $a = 2$, $b = 5$, $c = 8$
- Positive a (2) shows that it opens "up" (smiles)
- Axis of symmetry is $x = -\frac{b}{2a}$ or $x = -\frac{5}{2(2)} = -\frac{5}{4} = -1\frac{1}{4} = -1.25$
- Vertex – plug-in x value from axis of symmetry (-1.25) to get y :
 $y = 2(-1.25)^2 + 5(-1.25) + 8 = 2(1.562) + 5(-1.25) + 8 = 3.125 - 6.25 + 8 = 4.875$
 or Vertex = (-1.25, 4.875)

- y intercept = $c = 8$
- Select a couple more values of x

x	y
-1.25	4.875 (vertex)
0	8 (y-intercept)
1	15
-1	5



Graph $y = -x^2 - 8x - 3$

- X^2 shows that this is a parabola where $a = -1$, $b = -8$, $c = -3$
- $-a$ (-1) shows us the parabola opens "down" (frown)
- Axis of symmetry is $x = -\frac{b}{2a}$ or $x = -\frac{-8}{2(-1)} = -4$
- Vertex – plug-in x value (from axis of symmetry) to get y :
 $y = -(-4)^2 - 8(-4) - 3 = -16 - (-32) - 3 = 13$
or Vertex = $(-4, 13)$
- y intercept = $c = -3$
- Select a couple more values of x

x	y
-4	13 (vertex)
0	-3 (y-intercept)
1	-12
-1	4

