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Graph $y = ax^2 + bx + c$ (Ch 10, Sec 2)

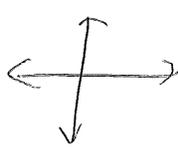
Properties of the Graph of a Quadratic Function

The graph of $y = ax^2 + bx + c$ is a parabola that:

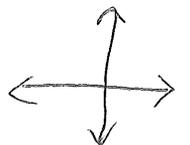
- opens up if $a > 0$ (positive)
- opens down if $a < 0$ (negative)
- is narrower than the parent function $y = x^2$ if $|a| > 1$ and wider if $|a| < 1$.
- has an axis of symmetry (vertical line through vertex)
the equation of the axis of symmetry is $x = \frac{-b}{2a}$.
- has a vertex with an x -coordinate of $\frac{-b}{2a}$
- has a y -intercept of $(0, c)$.

* the "bx" term shifts the vertex off of the y -axis

Maximum value/Minimum Value:

If the parabola opens up, the vertex is the _____ of the function. 

If the parabola opens down, the vertex is the _____ of the function.



Find the axis of symmetry, the vertex, and the y-intercept. Label the vertex as the ~~max~~ max/min.

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

$$y = x^2 - 6x + 11$$

$$a = 1$$

$$b = -6$$

$$c = 11$$

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

axis of symmetry: $x = 3$

vertex $(3, \frac{2}{y})$

y-intercept $(0, 11)$

plug in $x = 3$ to $y = x^2 - 6x + 11$

$$y = 3^2 - 6(3) + 11$$

$$y = 2$$

~~vertex~~ parabola opens up b/c a is positive

vertex is the minimum value.

$$y = -\frac{1}{4}x^2 + 3x - 2$$

$$a = -\frac{1}{4}$$

$$b = 3$$

$$c = -2$$

$$x = \frac{-b}{2a} = \frac{-(3)}{2(-\frac{1}{4})} = \frac{-3}{-0.5} = 6$$

axis of symmetry: $x = 6$

vertex $(6, 7)$ max

y-int $(0, -2)$

$$y = -\frac{1}{4}(6)^2 + 3(6) - 2$$
$$y = 7$$

Graph $y = 3x^2 + 12x - 8$

$a = 3$
 $b = 12$
 $c = -8$

Label the axis of symmetry, the vertex (max/min), and the y-intercept.

x	y
-4	-8
-3	-17
-2	-20
-1	-17
0	-8

vertex \star $(-2, -20)$

$-8 \leftarrow$ y-intercept

$$x = \frac{-b}{2a} = \frac{-(12)}{2(3)} = \frac{-12}{6} = -2$$

