

Bellwork: Algebra 1

1. Welcome back!! :)
2. You need a calculator and Algebra Nation book.
3. Answer the following question on your MONDAY

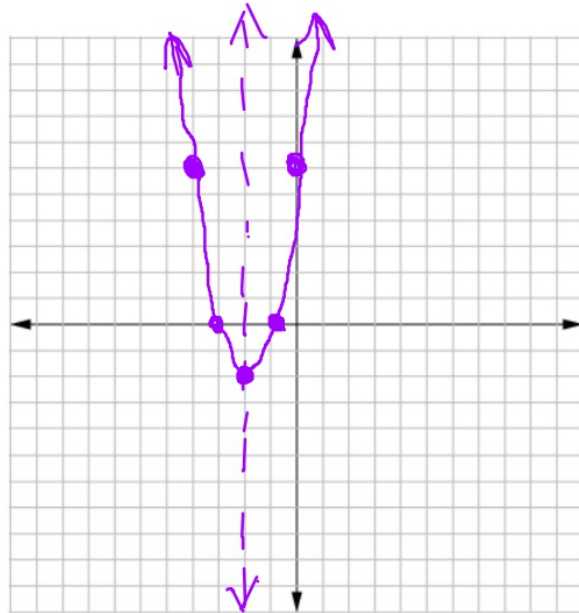
Bellwork: **Graph the parabola using the given information:**

Vertex: $(-2, -2)$

Axis of Symmetry: $x = -2$

Zeros: $(-3, 0)$ and $(-1, 0)$

Y-intercept: $(0, 6)$



Section 6 – Topic 4
Graphing Quadratic Functions Using the Vertex and Intercepts

pg. 156

Given a quadratic equation in standard form, $f(x) = x^2 - 4x - 12$, use the following steps to graph $f(x)$ on the coordinate plane on the following page.

Step 1: Use the a -value to determine if the graph should open upward (positive a) or downward (negative a).

$+a$, open up

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

Step 2: Find and graph the axis of symmetry using the formula $x = -\frac{b}{2a}$. This is also the h -coordinate of the vertex.

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

$$\begin{matrix} h & k \\ (2 & -16) \end{matrix}$$

Step 3: Find $f(h)$, the k -coordinate of the vertex, by substituting h into the equation. Plot the vertex, (h, k) , on the graph.

$$\begin{aligned} f(x) &= (2)^2 - 4(2) - 12 \\ &= 4 - 8 - 12 = -16 \end{aligned}$$

Step 4: Find and plot the y -intercept, which is the constant c in $f(x) = ax^2 + bx + c$. If possible, use the axis of symmetry to find a reflection point.

$$y = (0, -12)$$

$$y = mx + b$$

Step 5: Find and plot the x-intercepts of the function.
Factoring is one option, but you can always use the quadratic formula.

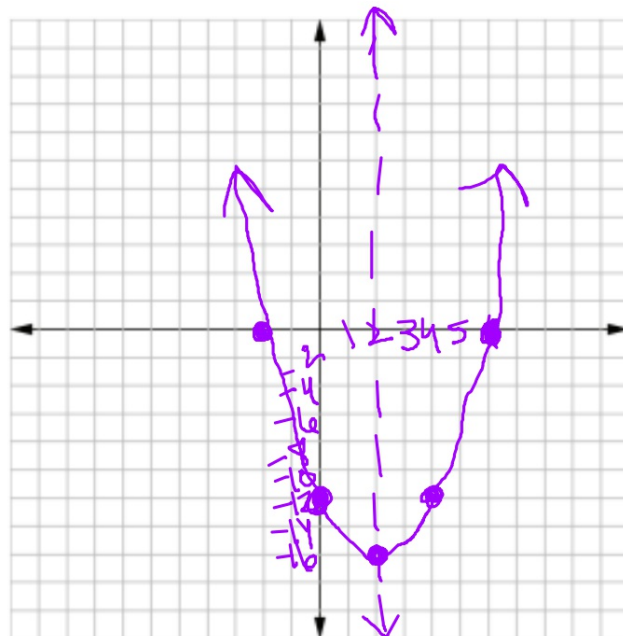
	X	-6
X	X ²	-6X
2	2X	-12

$$\begin{array}{r}
 -12x^2 \\
 -6x \quad 2x \\
 -4x
 \end{array}$$

$$\begin{array}{l}
 X+2=0 \\
 -2 \quad -2 \\
 X=-2
 \end{array}$$

$$\begin{array}{l}
 X-6=0 \\
 +6 \quad +6 \\
 X=6
 \end{array}$$

Graph of $f(x) = x^2 - 4x - 12$



Let's Practice!

1. Given the function $f(x) = -x^2 + 4x + 21$, use the following steps to graph $f(x)$ on the coordinate plane on the following page.

- a. Use the a -value to determine if the graph should open upward (positive a) or downward (negative a).

$-a$, open down

- b. Find and graph the axis of symmetry using the formula $x = \frac{-b}{2a}$. This is also the h -coordinate of the vertex.

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

- c. Find $f(h)$, the k -coordinate of the vertex, by substituting h into the equation. Plot the vertex, (h, k) , on the graph.

$$\begin{array}{c} h \quad k \\ (2, 25) \end{array}$$

$$\begin{aligned} f(x) &= \underbrace{-}(2)^2 + 4(2) + 21 \\ &= -4 + 8 + 21 = 25 \end{aligned}$$

$$\underbrace{(-2)^2} = 4$$

- d. Find and plot the y -intercept, which is the constant c in $f(x) = ax^2 + bx + c$. If possible, use the axis of symmetry to find a reflection point.

$$y = (0, 21)$$

- e. Find and plot the x-intercepts of the function.
Factoring is one option, but you can always use the quadratic formula.

	$-x$	7
x	$-x^2$	$7x$
3	$-3x$	21

$$\begin{array}{r} -21x^2 \\ 7x \quad -3x \\ 4x \end{array}$$

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

$$x + 3 = 0 \quad -x + 7 =$$

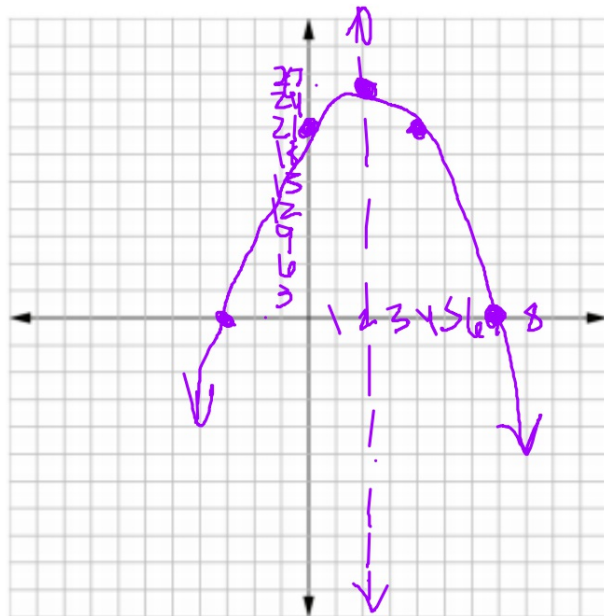
$$-3 \quad -3 \quad -7 \quad -$$

$$x = -3 \quad -x = -7$$

$$\quad \quad -1 \quad -1$$

$$\quad \quad x = 7$$

Graph of $f(x) = -x^2 + 4x + 21$



2. Jorah starts at the top of SlotZilla Zip Line in Las Vegas and rides down Fremont Street. The equation $h(t) = -2.3t^2 + 114$ models Jorah's height, in feet, above the ground over time, t seconds, while he rides the zip line.

a. What is the vertex of the function $h(t)$?

$$\text{axis of sym. } x = \frac{-b}{2a} = \frac{0}{2a} = 0$$

$$h(t) = -2.3(0)^2 + 114 = 114 \quad (0, 114)$$

b. When will Jorah reach the ground?

$$-2.3t^2 + 114 = 0$$

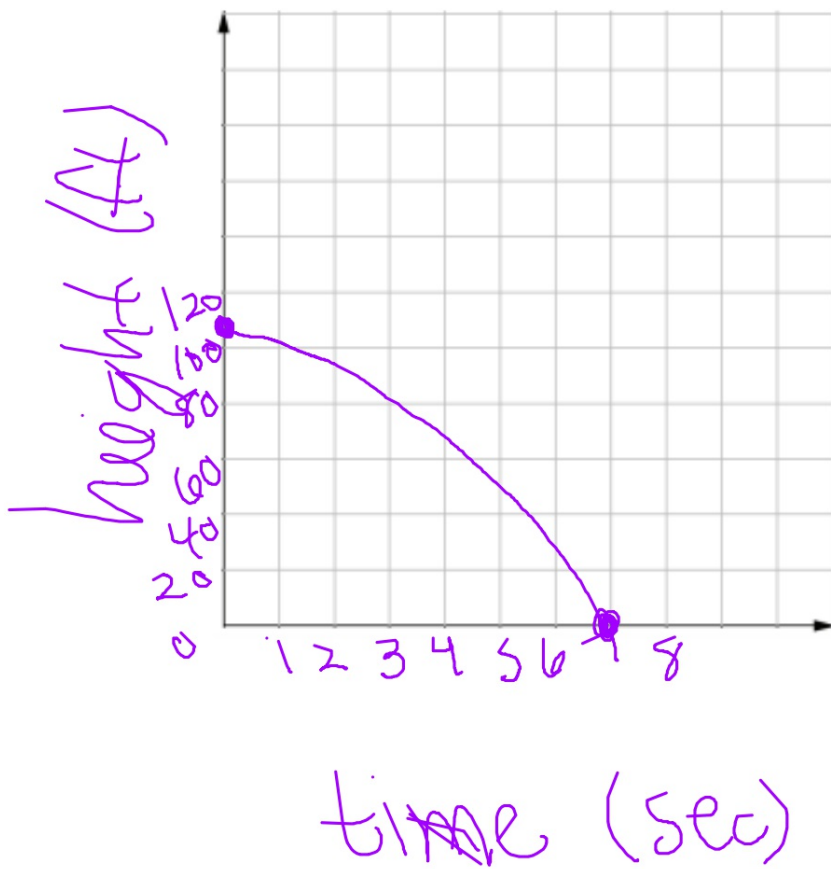
$$\frac{-2.3t^2}{-2.3} = \frac{-114}{-2.3}$$

$$\sqrt{t^2} = \sqrt{50}$$

$$t = \pm 7$$

7 seconds

- c. Sketch the graph that models Jorah's height over the time spent riding the zip line.



BEAT THE TEST!

1. On a test, Mia graphed the quadratic function $f(x) = x^2 - 10x - 24$. The problem was marked as incorrect. Identify Mia's mistake.

axis of sym:

$$x = \frac{-b}{2a} = \frac{10}{2} = 5$$

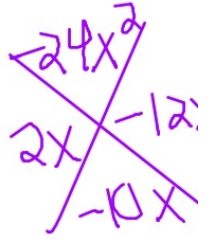
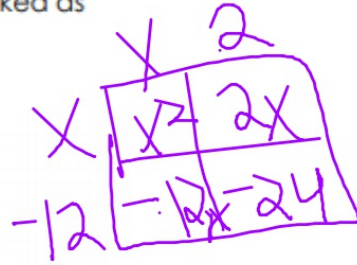
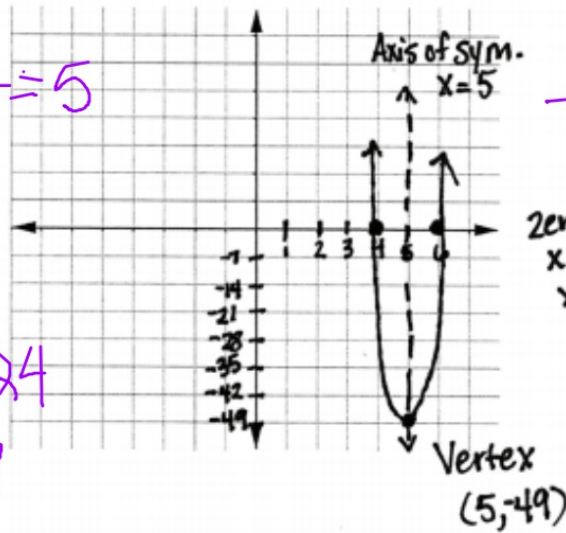
Vertex:

$$(5)^2 - 10(5) - 24$$

$$= 25 - 50 - 24$$

$$= -49$$

$$(5, -49)$$



zeros:
 $x=4$
 $x=6$

$$x+2=0$$

$$x-12=0$$

$$x=-2$$

$$x=12$$

Her zeros were wrong.