Solutions

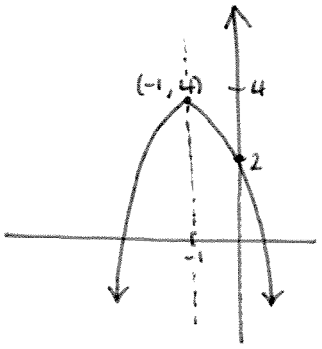
Vertex Form of a quadratic function Worksheet:

1.

(a) Vertex: $(-1, 4)$

y-int: $(0, 2)$

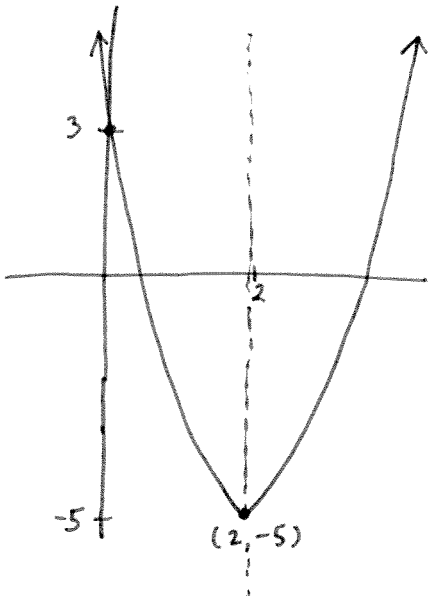
Axis of symmetry: $x = -1$



(b) Vertex: $(2, -5)$

y-int: $(0, 3)$

Axis of symmetry: $x = 2$



2.

(a) Vertex: $(-1, -4)$

point: $(-3, 0)$

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

$y = a(x+1)^2 - 4$

Plug in $(-3, 0)$ to find a:

$0 = a(-3+1)^2 - 4$

$0 = 4a - 4$

$\boxed{a = 1}$

$\therefore y = (x+1)^2 - 4.$

(b) vertex: $(-2, 4)$
point: $(-3, 3)$

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

$y = a(x+2)^2 + 4$ $\quad \therefore \; y = -(x+2)^2 + 4$.

Plug in $(-3, 3)$ to find a:

$3 = a(-3+2)^2 + 4$
$3 = a + 4$
$\boxed{a = -1}$

3. $y = -x^2 + 12x$.

Find the vertex:

$$x = \frac{-b}{2a} = \frac{-12}{2(-1)} = \frac{12}{2} = 6$$

$y = -(6)^2 + 12(6)$
$= -36 + 72$
$= 36$

$\therefore$ $(6, 36)$ is the vertex. It takes 6 seconds for the rocket to reach a maximum height of 36 metres.

4.

(a) Vertex : (3, 15)
point: (0, 0) or (6, 0)

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

Plug in the vertex:

$y = a(x-3)^2 + 15$

Plug in another point to get a: (0, 0) or (6, 0).

$0 = a(0-3)^2 + 15$

$0 = 9a + 15$

$\frac{-15}{9} = \frac{9a}{9}$

$\boxed{a = \frac{-15}{9}}$

$\therefore y = \frac{-15}{9}(x-3)^2 + 15$

(b) Plug in $x = 4$:

$y = \frac{-15}{9}(4-3)^2 + 15$

$= \frac{-15}{9} + 15$

$= \frac{-15 + 135}{9}$

$= \frac{120}{9}$

$= 13.33$

$\therefore$ After 4 seconds the ball is at a height of 13.33 ft.

5. $y = -5x^2 + 20x + 1$

Find the vertex:

$$X = \frac{-b}{2a} = \frac{-20}{2(-5)} = \frac{-20}{-10} = 2$$

Plug $X = 2$ into our equation to get max height:

$$y = -5(2)^2 + 20(2) + 1$$

$$= -5(4) + 40 + 1$$

$$= -20 + 40 + 1$$

$$= 21$$

$\therefore$ $(2, 21)$ is the vertex. It takes the skier 2 seconds to reach a maximum height of 21 metres.