

Name: _____

Date: _____

Learning Goal 3.2

Given a quadratic function, identify the characteristics of graphs, including domain, range, intercepts, vertex and the axis of symmetry.

Standard Form

$$f(x) = ax^2 + bx + c$$

vertex form: $f(x) = a(x-p)^2 + q$

Review of Factoring

a. $f(x) = x^2 - 4x$

$$= x(x-4)$$

b. $g(x) = x^2 - 5x + 6$

$$= (x-2)(x-3)$$

c. $h(x) = -x^2 + 2x + 8$

$$= -(x^2 - 2x - 8)$$

$$= -(x-4)(x+2)$$

d. $j(x) = -2x^2 + 4x + 30$

$$= -2(x^2 - 2x - 15)$$

$$= -2(x-5)(x+3)$$

e. $k(x) = -\frac{1}{4}x^2 - 3x + 7$

$$= -\frac{1}{4}(x^2 + 12x - 28)$$

$$= -\frac{1}{4}(x+14)(x-2)$$

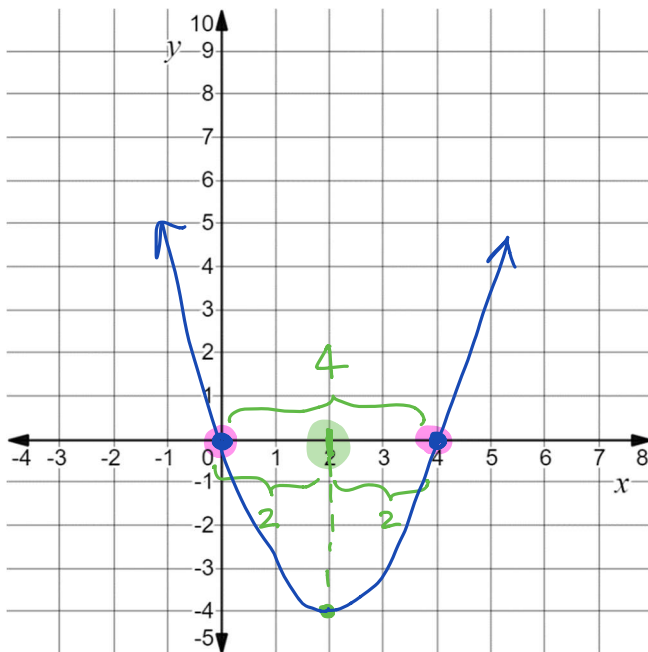
f. $m(x) = 2x^2 - 13x + 6$

$$= 2x^2 - 12x - x + 6$$

$$= 2x(x-6) - (x-6)$$

$$= (x-6)(2x-1)$$

Example Graph $n(x) = x^2 - 4x$ and find the



x - intercept(s) $y=0$

$$x^2 - 4x = 0$$

$$x(x-4) = 0$$

y - intercept(s) $x=0$

$$\downarrow \quad \downarrow$$

$$\underline{x=0} \quad \underline{x-4=0}$$

$$\quad \quad \underline{x=4}$$

Domain $\{x \mid x \in \mathbb{R}\}$

Range $\{y \mid y \geq -4, y \in \mathbb{R}\}$

Axis of Symmetry $x=2$

Vertex $(2, -4)$

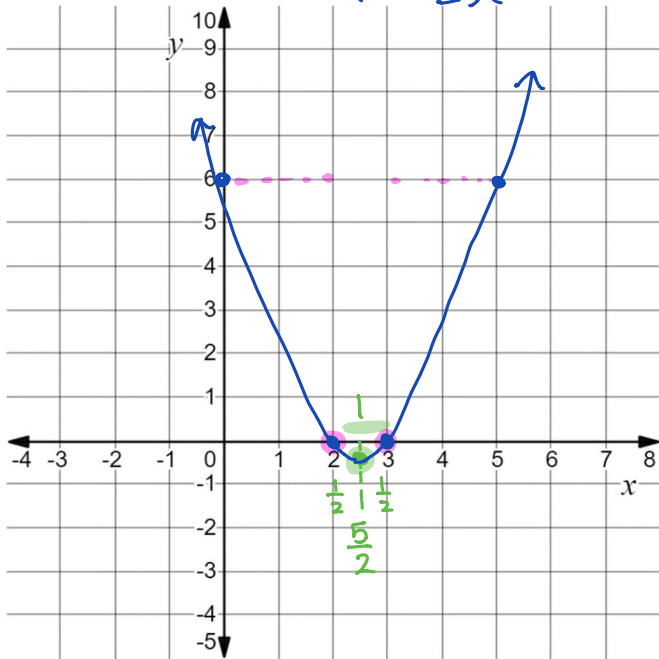
Max/Min and value $y=-4$

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

$$= 4 - 8$$

$$= -4$$

Example Graph $p(x) = x^2 - 5x + 6$ and find the x -intercept(s)
 $= (x-2)(x-3)$



$(x-2)(x-3) = 0$
 $x-2=0 \rightarrow x=2$
 $x-3=0 \rightarrow x=3$

Domain: $\{x | x \in \mathbb{R}\}$

Range: $\{y | y \geq -\frac{1}{4}, y \in \mathbb{R}\}$

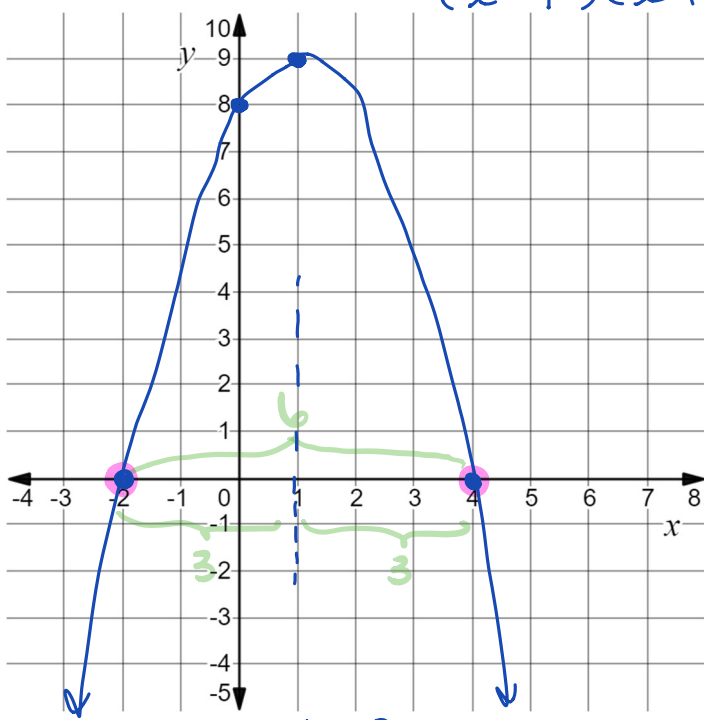
Axis of Symmetry: $x = \frac{5}{2}$

Vertex: $(\frac{5}{2}, -\frac{1}{4})$

Max/Min and value: $y = -\frac{1}{4}$

$y = (\frac{5}{2})^2 - 5(\frac{5}{2}) + 6$
 $= \frac{25}{4} - \frac{25}{2} + 6 = -\frac{1}{4}$

Example Graph $q(x) = -x^2 + 2x + 8$ and find the x -intercept(s)
 $= -(x-4)(x+2)$



$-(x-4)(x+2) = 0$
 $x-4=0 \rightarrow x=4$
 $x+2=0 \rightarrow x=-2$

Domain: $\{x | x \in \mathbb{R}\}$

Range: $\{y | y \leq 9, y \in \mathbb{R}\}$

Axis of Symmetry: $x = 1$

Vertex: $(1, 9)$

Max/Min and value: $y = 9$

$y = -(1)^2 + 2(1) + 8$
 $= -1 + 2 + 8 = 9$