

## Algebra 1

Our Goal: To learn to graph quadratic functions  
of the form  $f(x) = a(x-p)(x-q)$

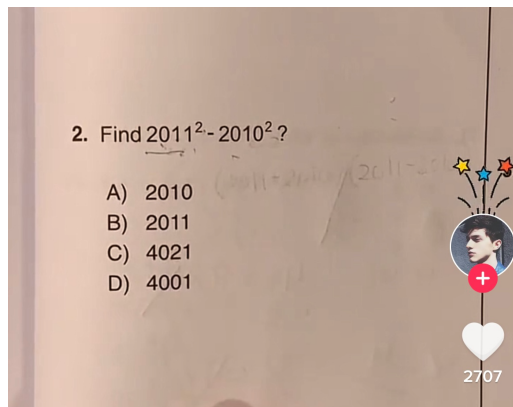
Warm Up: Check and discuss homework

### Today's Homework

8.5 Exercises, p.455-456: 6-72 (multiples of 6)  
that's 6,12,18,24,30,36,42,48,54,60,66,72  
(graph paper online, if helpful)

### Previous Homework

8.4 Exercises, p.446-448: 6-66 (multiples of 6)  
that's 6,12,18,24,30,36,42,48,54,60,66



Factor the expression.

1.  $4x^2 - 49$

$$(2x+7)(2x-7)$$

2.  $x^2 + 6x + 8$

$$(x+4)(x+2)$$

3.  $2a^2 - 9a - 5$

$$(2a+1)(a-5)$$

4.  $x^2 - 3x$

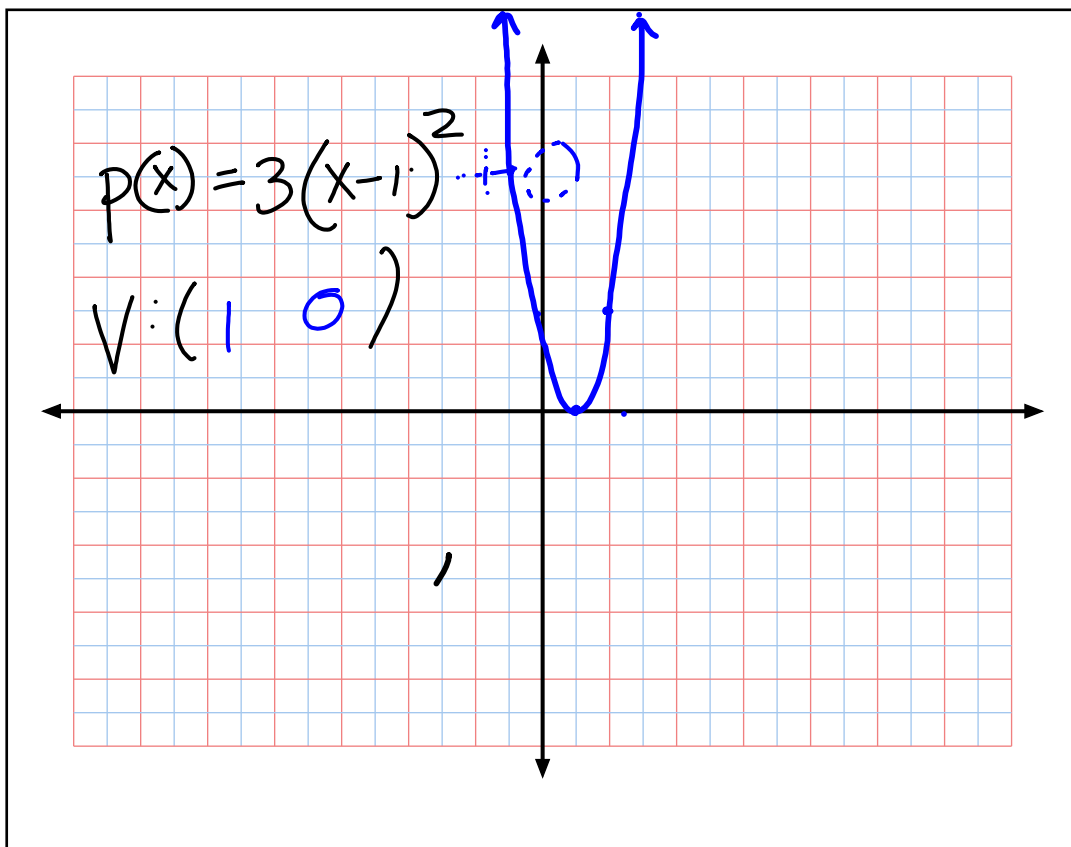
$$x(x-3)$$

5.  $a^2 + 5a + 4$

$$(a+4)(a+1)$$

6.  $2t^2 + 7t - 4$

$$(2t-1)(t+4)$$



$$y = -\left(x+8\right)^2 - \left(-x+8\right)^2$$

~~vertex (0, -8)~~

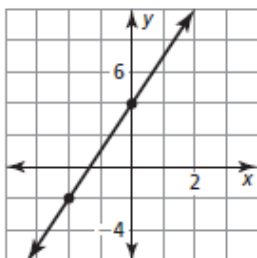
$$V: (-8, 0)$$

$$8+x$$

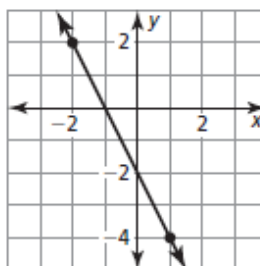
$$8-x$$

Write an equation in slope-intercept form of the line shown.

1.



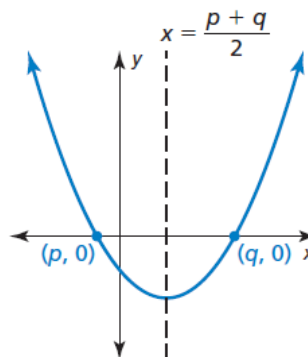
2.



## Core Concept

**Graphing  $f(x) = a(x - p)(x - q)$**

- The  $x$ -intercepts are  $p$  and  $q$ .
- The axis of symmetry is halfway between  $(p, 0)$  and  $(q, 0)$ . So, the axis of symmetry is  $x = \frac{p + q}{2}$ .
- The graph opens up when  $a > 0$ , and the graph opens down when  $a < 0$ .



Graph  $f(x) = -(x + 1)(x - 5)$ . Describe the domain and range.

$$-(2+1)(2-5)$$

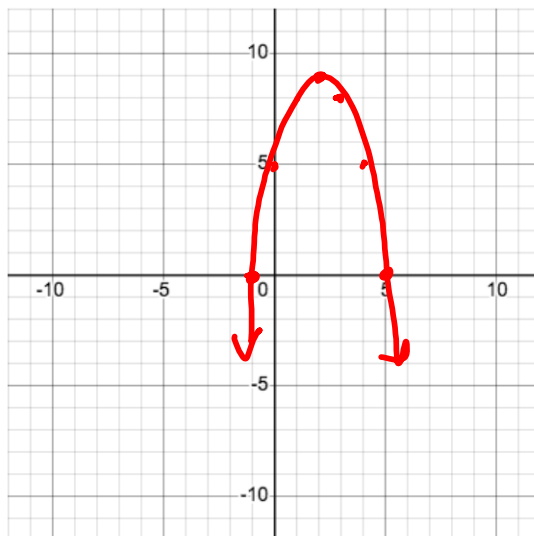
$$-3 \cdot (-3)$$

x-int: -1, 5

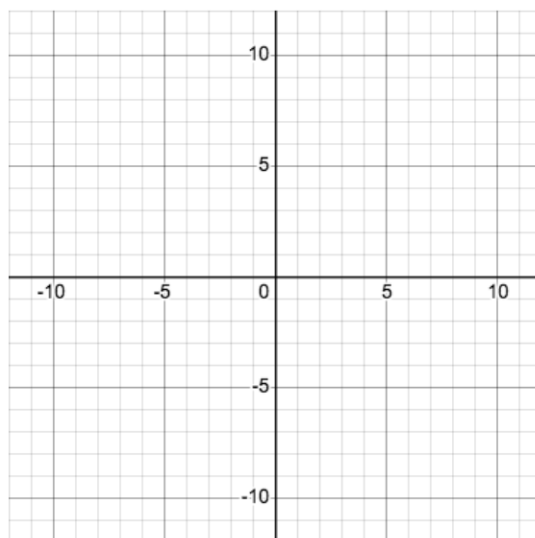
$$0 = -(x+1)(x-5)$$

$$\frac{-1+5}{2}$$

$$(2, 9)$$



Graph  $f(x) = 2x^2 - 8$ . Describe the domain and range.



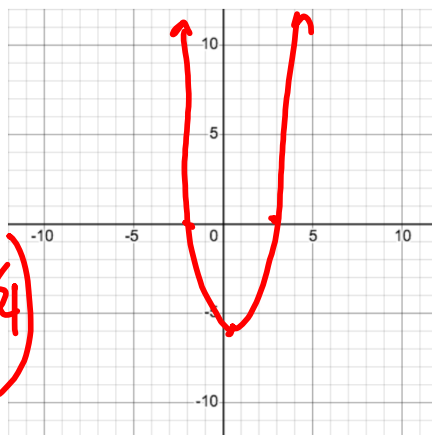
**Graph the quadratic function. Label the vertex, axis of symmetry, and x-intercepts. Describe the domain and range of the function.**

①  $f(x) = (x + 2)(x - 3)$       ②  $g(x) = -2(x - 4)(x + 1)$

$$\frac{-2+3}{2}$$

$$\left(\frac{1}{2}; -6\frac{1}{4}\right)$$

$$(2.5; -2.5)$$



### Core Concept

#### Factors and Zeros

For any factor  $x - n$  of a polynomial,  $n$  is a zero of the function defined by the polynomial.

Find the zeros of  $f(x) = (x - 1)(x + 2)$ .

$$x\text{-int: } 1, -2$$

Find the zeros of each function.

a.  $f(x) = -2x^2 - 10x - 12$

b.  $h(x) = (x - 1)(x^2 - 16)$

$$h(x) = (x - 1)(x - 4)(x + 4)$$

$$\text{zeros: } 1, 4, -4$$

Find the zero(s) of the function.

✓ 4.  $f(x) = (x - 6)(x - 1)$

6, 1

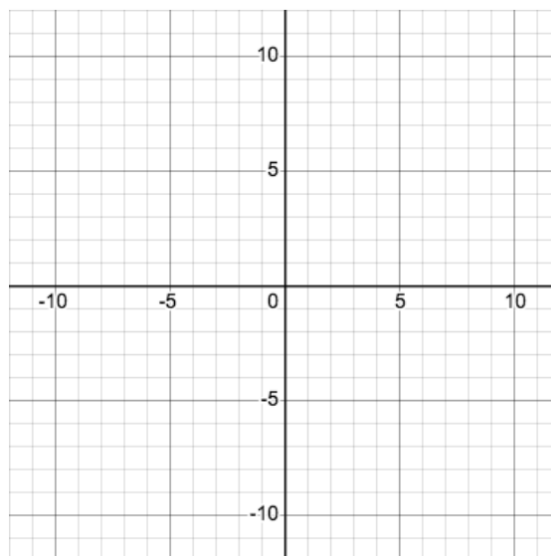
✓ 5.  $g(x) = 3x^2 - 12x + 12$

$$3(x^2 - 4x + 4)$$
$$3(x - 2)(x - 2)$$

6.  $h(x) = x(x^2 - 1)$

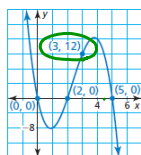
zeros: 2

Use zeros to graph  $h(x) = x^2 - 2x - 3$ .





The graph represents a cubic function. Write the function.



↓  
3rd degree

$$f(x) = a(x-0)(x-2)(x-5)$$

$$f(x) = a \times (x-2)(x-5)$$

$$12 = a \cdot 3(3-2)(3-5)$$

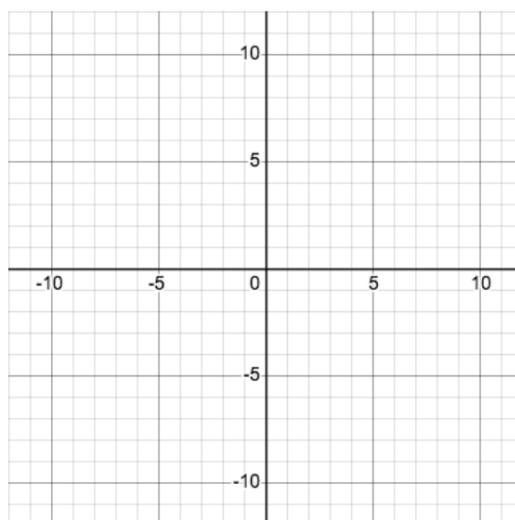
$$12 = 3a(-2)$$

$$12 = -6a$$

$$a = -2$$

$$f(x) = -2x(x-2)(x-5)$$

Use zeros to graph  $f(x) = x^3 - 4x$ .



The zeros of a cubic function are  $-3$ ,  $-1$ , and  $1$ . The graph of the function passes through the point  $(0, -3)$ . Write the function.

$$y = a(x - (-3))(x - (-1))(x - 1)$$

$$y = a(x + 3)(x + 1)(x - 1)$$

$$-3 = a(0 + 3)(\cancel{0 + 1})(0 - 1)$$

$$-3 = -3a$$

$$a = 1$$

$$y = (x + 3)(x + 1)(x - 1)$$

Exit Ticket: Use zeros to sketch the graph of  $f(x) = -(x + 2)(x - 3)$

$$x \quad - (8+x)$$

$$\begin{array}{r}
 8+x \quad 8-x \\
 \quad \quad \quad \curvearrowright \\
 \quad \quad \quad -(-8+x) \\
 \quad \quad \quad 8-x
 \end{array}$$