

7-1

Solving by Factoring

Objective: I can solve quadratic equations by factoring and using the zero-product property.

I can write a quadratic equation given the zeros or x-intercepts

What does it mean to "solve" an equation?

*Finding a value that makes
the equation true.*

The Zero-Product Property

If $ab = 0$, then $a = 0$ or $b = 0$ or both a and b are 0

$$(\quad)(\quad) = 0$$

Solve

$$(x + 5)(2x - 3) = 0$$

$$\begin{array}{l} x+5=0 \\ -5 \quad -5 \\ \hline x=5 \end{array} \quad \begin{array}{l} 2x-3=0 \\ +3 \quad +3 \\ \hline 2x=3 \\ \frac{2x}{2}=\frac{3}{2} \\ x=\frac{3}{2} \end{array}$$

Solve

$$x(x + 9) = 0$$

$$x=0, -9$$

Your turn! Solve

$$(x - 1)(4x + 7) = 0$$

$$\begin{array}{l} x-1=0 \\ +1 \quad +1 \\ \hline x=1 \end{array}$$

$$\begin{array}{l} 4x+7=0 \\ -7 \quad -7 \\ \hline 4x=-7 \\ \frac{4x}{4}=\frac{-7}{4} \\ x=-\frac{7}{4} \end{array}$$

Solve by factoring

$$x^2 - 20x + 100 = 0$$

$$(x-10)(x-10) = 0$$

$$x = 10$$

$$2x^2 - 5x = 3$$

$$2x^2 - 5x - 3 = 0$$

$$2x^2 - 6x + x - 3 = 0$$

$$2x(x-3) + (x-3) = 0$$

$$(x-3)(2x+1) = 0$$

$$x = 3, -\frac{1}{2}$$

Solve by factoring

$$x^2 + 10x + 15 = -6$$

$$x^2 + 10x + 21 = 0$$

$$(x+7)(x+3) = 0$$

$$x = -7, -3$$

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

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

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

$$x^2 - 5x + 4 = 4$$

$$x^2 - 5x = 0$$

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

$$x = 0, 5$$

Your Turn!

Solve by factoring

$$x^2 + 5x + 4 = 0$$

$$(x+4)(x+1) = 0$$

$$x = -4, -1$$

$$2x+b=0$$

$$2x=-b$$

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

$$2x^2 + 12x = -18$$

$$2x^2 + 12x + 18 = 0$$

$$2(x^2 + 6x + 9) = 0$$

$$2(x+3)(x+3) = 0$$

$$x = -3$$

TASK: Solve $x^2 + 6x + 5 = 0$ by factoring

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

$-5, -1$ Solutions
What # that makes $y=0$

$$\text{Graph } f(x) = x^2 + 6x + 5$$

$$\text{Graph } f(x) = (x+1)(x+5)$$

What do you notice about the solution and the graphs?

$$0 = x^2 + 6x + 5$$

$$f(x) = x^2 + 6x + 5$$

$$\text{Solutions: } x = -5, -1$$

$$\text{Zeros: } -5, -1$$

TASK: Solve $x^2 - x + 12 = 0$ by factoring

Graph $f(x) = x^2 - x + 12$

Graph $f(x) = (x + 3)(x - 4)$

What do you notice about the solution and the graphs?

When we solve a quadratic equation, this is called finding the zero's, where the graph crosses the x-axis.

Find the zeros of the function by factoring and *check* with your calculator

$$y = 2x^2 + 7x - 7 \quad 2 \cdot -7 = -14$$

$$y = 2x^2 = 2x + 7x - 7$$

$$y = 2x(x-1) + 7(x-1)$$

$$y = (x-1)(2x+7)$$

$$x = \frac{1}{2}, -\frac{7}{2}$$

Your Turn!

Find the zeros of the function by factoring and check with your calculator

$$f(x) = 2x^2 + 3x - 20$$

$$2 \cdot -20 = -40$$

$$\begin{array}{r} 1 \\ -5 \end{array} \begin{array}{r} 8 \end{array}$$

$$f(x) = 2x^2 + 8x - 5x - 20$$

$$f(x) = 2x(x+4) - 5(x+4)$$

$$f(x) = (x+4)(2x-5)$$

$$x = -4, \frac{5}{2}$$

$$\begin{array}{l} 2x-5=0 \\ 2x=5 \\ x=\frac{5}{2} \end{array}$$

$$y = x^2 - 16$$

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

$$x = 4, -4$$

Write a function with zeros of -1 and 3

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

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

Write a function with zeros of -2 and -6

$$f(x) = (x+2)(x+6)$$

Your turn: Write a function with zeros of -4 and 10

$$f(x) = (x+4)(x-10)$$

Your turn: Write a function with zeros of 5 and -2

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

The product of 2 consecutive integers is 156. Find the two integers.

12, 13

$$x(x+1) = 156$$

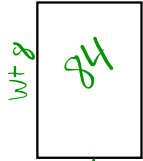
$$x(x+1) - 156 = 0$$

$$x^2 + x - 156 = 0$$

$$(x-12)(x+13) = 0$$

$$x = 12, -13$$

The length of a rectangle is 8 feet more than its width. If the area of the rectangle is 84 square feet, what are the dimensions of the rectangle?



$$w = 6$$
$$l = 14$$

$$w(w+8) = 84$$

$$w^2 + 8w - 84 = 0$$

$$-6 \quad 14$$

$$(x-6)(x-14) = 0$$

$$(6) \quad 14$$