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

( )( ) = 0

Solve

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

$x+5=0$ $-5\ -5$

$x=-5$

$2x-3=0$ $+3\ +3$

$\frac{2x}{2}=\frac{3}{2}$

$x=\frac{3}{2}$

Solve

x(x + 9) = 0

$x=0, -9$

Your turn! Solve

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

$x-1=0$ $+1\ +1$

$x=1$

$4x+7=0$ $-7\ -7$

$\frac{4x}{4}=\frac{-7}{4}$

$x=-\frac{7}{4}$

Solve by factoring

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

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

$x=10$

$2x^2 - 5x = 3$

$-3 \quad -3$

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

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

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

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

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

$2 \cdot -3 = -6$

$-6 \quad +1$

Solve by factoring

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

$+6 \quad +6$

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

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

$x=-7, -3$

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

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

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

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

$-4 \quad -4$

$x^2-5x=0$

$x(x-5)=0$

$x=0, 5$

Your Turn!

Solve by factoring

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

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

$x=-4, -1$

$2x+6=0$

$2x=-6$

$x=-3$

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

$+18 \quad +18$

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

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

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

$x=-3$

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

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

$-5, -1$ Solutions (what # that makes y 0)

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

Graph $f(x) = (x + 1)(x + 5)$

What do you notice about the solution and the graphs?

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

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

Solutions: $x=-5, -1$

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

$y = 2x^2 + 5x - 7$ $2 \cdot -7 = -14$

$f(x) = 5x^2 - 3x - 1$

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

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

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

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

Your Turn!

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

$f(x) = 2x^2 + 3x - 20$ $2 \cdot -20 = -40$ $-5, 8$

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

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

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

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

$2x - 5 = 0$

$2x = 5$

$x = \frac{5}{2}$

$y = x^2 - 16$

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

$x = 4, -4$

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

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

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?

$w = 6$

$\ell = 14$

$w(w+8) = 84$

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

$-6 \quad 14$

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

$6, -14$