2.6 Solving Quadratic Equations by factoring

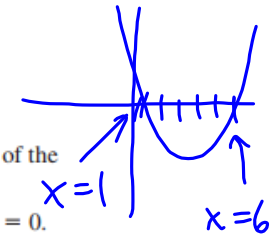
Objective: Find the solutions (zeros) to a quadratic equation.

Core Concept

Zero-Product Property

Words If the product of two expressions is zero, then one or both of the expressions equal zero.

Algebra If A and B are expressions and $AB = 0$, then $A = 0$ or $B = 0$.



Find the value of x.

Ex1) $(x + 4)(x + 7) = 0$

$x+4=0$ or $x+7=0$

$x=-4$ $x=-7$

Ex2) $2x(3x - 2) = 0$

$2x=0$ or $3x-2=0$

$+2 \quad +2$

$x=0$

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

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

We have solved quadratic equations by graphing, square roots and completing the square. Another method we can use is FACTORING.

REMEMBER FACTORING:

- Always check for a GCF first $2x + 10 = 2(x + 5)$
- 2 terms- Difference of Squares $25x^2 - 16 = (5x + 4)(5x - 4)$
- 3 terms- Factor directly

yay! $x^2 - 5x - 6 = (x - 6)(x + 1)$

☹ $(x - 3)(x + 2)$

ugh! $2x^2 - x - 3 = (2x - 3)(x + 1)$

Ex. 3 Solve by factoring:

$x^2 - 4x = 45$

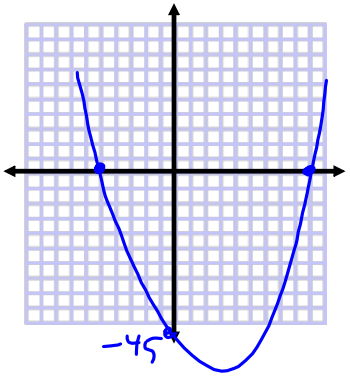
$-45 \quad -45$

$x^2 - 4x - 45 = 0$

$(x - 9)(x + 5) = 0$

$x = 9 \quad x = -5$

- Set the equation = 0
- Factor the equation
- Zero-Product Property
- Solve for x



If a real number k is a zero of the function $f(x) = ax^2 + bx + c$, then k is an x-intercept of the graph of the function, and k is also a root of the equation $ax^2 + bx + c = 0$

"zero" "root" "x-intercept"

A **zero** of a function, f, is an x-value for which f(x) = 0.

Find the ZEROS of the quadratic function:

Ex4) $f(x) = 2x^2 - 11x + 12$

$0 = 2x^2 - 11x + 12$

$0 = (2x - 3)(x - 4)$

$2x - 3 = 0 \quad x - 4 = 0$

$2x = 3 \quad x = 4$

$x = 3/2$

Ex5) $f(x) = 4x^3 - 36x$

$0 = 4x^3 - 36x$

$0 = 4x(x^2 - 9)$

$0 = 4x(x - 3)(x + 3)$

$x = 0 \quad x = 3 \quad x = -3$

Ex6) $3x^2 + 5x = 2$

-2

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

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

$3x - 1 = 0 \quad x + 2 = 0$

$3x = 1 \quad x = -2$

$x = 1/3$

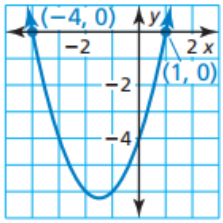
Ex7) $2x^2 + 8x = f(x)$

$2x^2 + 8x = 0$

$2x(x + 4) = 0$

$x = 0 \quad x = -4$

Ex8) Use the x-intercepts to write a quadratic function in standard form.



$x = -4$ $\quad$ $x = 1$

$+4 \quad +4$ $\quad$ $-1 \quad -1$

$x+4=0$ $\quad$ $x-1=0$

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

$x^2-1x+4x-4=0 \rightarrow x^2+3x-4=f(x)$

Ex9) Write a quadratic function in standard form with zeros 1/5 and -5.

$x = \frac{1}{5}$ $\quad$ $x=-5$

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

$5\left(x-\frac{1}{5}\right)=0 \cdot 5$ $\quad$ $x+5=0$

$5x-1=0$ $\quad$ $x+5=0$

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

$5x^2+25x-x-5=0$

$5x^2+24x-5=f(x)$