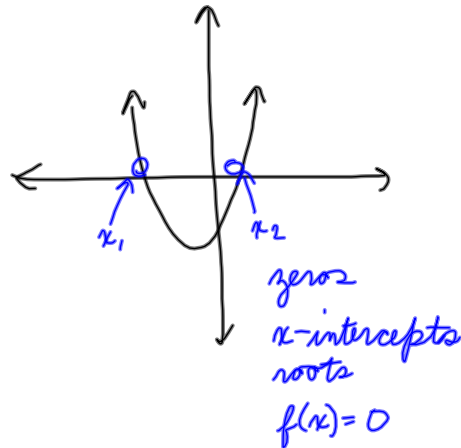


## Sec. 4.5 Quadratic Equations

Zero Product Property

If  $a \cdot b = 0$

then  $a=0$  or  $b=0$



Problem 1:

Solve  $x^2 + 3x - 18 = 0$

$x^2 - 3x + 6x - 18 = 0$

$x(x-3) + 6(x-3) = 0$   $(x-3)(x+6)$

$(x-3)(x+6) = 0$

\*

$x-3=0$

$+3 +3$

$x=3$

$x+6=0$

$-6 -6$

$x=-6$

Problem 2:

Solve  $10x^2 + 2x - 42 = x - 4$

$\frac{-420}{-20 \cdot 21}$

$10x^2 + x - 42 = 0$

$10x^2 - 20x + 21x - 42 = 0$

$10(x-2) + 21(x-2) = 0$

$(x-2)(10x+21) = 0$

$x-2=0$

$+2 +2$

$x=2$

$10x+21=0$

$-21 -21$

$\frac{10x}{10} = \frac{-21}{10}$

$x = \frac{-21}{10}$

Solve.

a.  $x^2 + 6x + 8 = 0$

$$\begin{array}{r} 8 \\ 1 \cdot 8 \\ \hline 2 \cdot 4 \end{array}$$

$$\underline{x^2 + 2x} + \underline{4x + 8} = 0$$

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

$$(x+2)(x+4) = 0$$

$$\begin{array}{r} x+2=0 \\ -2 \quad -2 \\ \hline \end{array}$$

$$\begin{array}{r} x+4=0 \\ -4 \quad -4 \\ \hline \end{array}$$

$$\boxed{x = -2}$$

$$\boxed{x = -4}$$

b.  $x^2 + 18 = 9x$

$$\underline{-9x} \quad \underline{-9x}$$

$$x^2 - 9x + 18 = 0$$

$$\begin{array}{r} 18 \\ 1 \cdot 18 \\ 2 \cdot 9 \\ \hline \end{array}$$

$$\underline{x^2 - 3x} - \underline{6x + 18} = 0 \quad \boxed{-3 \cdot 6}$$

$$x(x-3) - 6(x-3) = 0$$

$$(x-3)(x-6) = 0$$

$$\begin{array}{r} x-3=0 \\ +3 \quad +3 \\ \hline \end{array}$$

$$\begin{array}{r} x-6=0 \\ +6 \quad +6 \\ \hline \end{array}$$

$$\boxed{x = 3}$$

$$\boxed{x = 6}$$

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

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

$$\boxed{x = 0}$$

$$\begin{array}{r} x-4=0 \\ +4 \quad +4 \\ \hline \end{array}$$

$$\boxed{x = 4}$$

a.c : 1 · 0 = 0

$$x^2 - 4x + 0$$

$$\underline{x^2 + 0x} - \underline{4x + 0}$$

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

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

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

$$x = 0$$

$$\begin{array}{r} x-4=0 \\ +4 \quad +4 \\ \hline \end{array}$$

$$x = 4$$

$$\begin{array}{r} 0 \\ 0 \cdot 0 \\ 0 \cdot 1 \\ 0 \cdot 2 \\ 0 \cdot 3 \\ 0 \cdot 4 \\ 0 \cdot 5 \end{array}$$

$$d. 6x^2 + 4x = 0$$

$$\begin{array}{cc} & \downarrow & \downarrow \\ 2x & & \\ \swarrow & & \searrow \\ 2x & & 2x \\ \frac{2x}{2} = 0 & & \frac{3x+2}{-2} = 0 \end{array}$$

$$\boxed{x=0}$$

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

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

$$\frac{6x^2}{2} + \frac{4x}{2} = \frac{0}{2}$$

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

$$e. 3x^2 = 16x + 12$$

$$\frac{-16x-12 \quad -16x \quad -12}{\hline}$$

$$3x^2 - 16x - 12 = 0$$

$$\underline{3x^2 - 18x + 2x - 12 = 0}$$

$$3x(x-6) + 2(x-6)$$

$$(x-6)(3x+2) = 0$$

$$x-6=0$$

$$x=6$$

$$\frac{3x+2=0}{-2 \quad -2}$$

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

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

$$a.c = \frac{-36}{1 \cdot 36}$$

2 · 18
3 · 12
4 · 9
6 · 6

The path of a baseball is modeled by the function  $f(x) = -0.002x^2 + 0.77x$  where  $f(x)$  gives the height of the ball and  $x$  gives the distance from where it is hit in feet.

- a. How far does the ball travel before hitting the ground? distance  $\rightarrow x =$   
height  $f(x) = 0$

$$0 = -0.002x^2 + 0.77x$$

$$0 = x(-0.002x + 0.77)$$

$$\boxed{x = 0}$$

$$-0.002x + 0.77 = 0$$

$$\begin{array}{r} -0.002x = -0.77 \\ \hline -0.002 \quad -0.002 \end{array}$$

$$\boxed{x = 385 \text{ ft}}$$

Problem: Solve:

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

$$\frac{5x^2 - 2x - 2 = 0}{a=5 \quad b=-2 \quad c=-2}$$

$$a=5 \quad b=-2 \quad c=-2$$

$$\frac{a \cdot c}{5(-2)} = \frac{-10}{2 \cdot 5}$$

Quadratic Formula:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{2 \pm \sqrt{4 + 40}}{2(5)}$$

$$x = \frac{2 \pm \sqrt{44}}{10}$$

$$x = \frac{2 \pm 2\sqrt{11}}{10} = \frac{1 \pm \sqrt{11}}{5}$$

$$x = \frac{1 \pm \sqrt{11}}{5}$$

$$\frac{x^2 - 5x + 6}{x^2 - 4} \cdot \frac{x^2 + 3x + 2}{x^2 - 2x - 3}$$

$$\frac{\cancel{(x-2)}\cancel{(x-3)}}{\cancel{(x+2)}\cancel{(x-2)}} \cdot \frac{\cancel{(x+1)}\cancel{(x+2)}}{\cancel{(x-3)}\cancel{(x+1)}} = 1$$