

## 2.1: Quadratic Equations

A quadratic equation in standard form can be written as

$$ax^2 + bx + c = 0, a \neq 0$$

Four solution methods.

- (1) Factoring                      (3) Completing the square  
(2) Quadratic Formula          (4) graphing.

Solve using the quadratic formula.

Recall, if  $ax^2 + bx + c = 0, a \neq 0$

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

ex: solve  $10x^2 - x - 65 = 0$

$a = 10$                        $x = \frac{1 \pm \sqrt{1 - 4(10)(-65)}}{2(10)}$   
 $b = -1$                        $= \frac{1 \pm \sqrt{2601}}{20}$   
 $c = -65$                        $= \frac{1 \pm 51}{20}$

$\Rightarrow x = \frac{52}{20}$  or  $x = \frac{-50}{20}$

ex: solve  $(y+2)(y-5) = 7$

$$\Rightarrow y^2 - 5y + 2y - 10 = 7$$

$$\Rightarrow y^2 - 3y - 17 = 0$$

$$a = 1$$

$$\Rightarrow y = \frac{3 \pm \sqrt{9 - 4(1)(-17)}}{2(1)}$$

$$b = -3$$

$$c = -17$$

$$= \frac{3 \pm \sqrt{77}}{2}$$

Quad. Formula rocks!

$$ax^2 + bx + c = 0 \Rightarrow x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$* x^2 + 9x + 8 = 0 \Rightarrow x = \frac{-9 \pm \sqrt{9^2 - 4(1)(8)}}{2(1)}$$

$$a \heartsuit^2 + b\heartsuit + c = 0 \Rightarrow \heartsuit = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$a ( )^2 + b ( ) + c = 0$$

$$\Rightarrow ( ) = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$\text{ex: } (x+8)^2 + 3(x+8) + 2 = 0$$

$$\Rightarrow x+8 = \frac{-3 \pm \sqrt{9 - 4(1)(2)}}{2(1)}$$

$$= \frac{-3 \pm \sqrt{1}}{2}$$

$$\Rightarrow x+8 = \frac{-3 \pm 1}{2}$$

$$\Rightarrow x+8 = -1 \quad \text{OR} \quad x+8 = -2$$

$$\Rightarrow x = -9 \quad \text{OR} \quad x = -10.$$

ex: solve  $\frac{x}{x-1} = 2x + \frac{1}{x-1}$

$$\Rightarrow x = 2x(x-1) + 1$$

$$\Rightarrow x = 2x^2 - 2x + 1$$

$$\Rightarrow 0 = 2x^2 - 3x + 1$$

$$\begin{aligned} a &= 2 \\ b &= -3 \\ c &= 1 \end{aligned}$$

$$\Rightarrow x = \frac{3 \pm \sqrt{9 - 4(2)(1)}}{2(2)}$$

$$= \frac{3 \pm 1}{4}$$

$\Rightarrow$   ~~$x=1$~~  OR  $x = \frac{1}{2}$   
extraneous soln

Solve by factoring.

ex: solve  $x^2 + 5x = 21 + x$

$$\Rightarrow x^2 + 4x - 21 = 0$$

$$\Rightarrow (x+7)(x-3) = 0$$

$$\Rightarrow x+7=0 \quad \text{OR} \quad x-3=0$$

$$\Rightarrow x=-7 \quad \text{OR} \quad x=3.$$

ex: solve  $(x-3)(1-x)=1$

$$\Rightarrow x - x^2 - 3 + 3x = 1$$

$$\Rightarrow -x^2 + 4x - 4 = 0$$

$$\Rightarrow x^2 - 4x + 4 = 0$$

$$\Rightarrow (x-2)(x-2) = 0$$

$$\Rightarrow x=2$$

solve by graphing

ex:  $49x^2 + 28x + 4 = 0$

Graph  $y = 49x^2 + 28x + 4$   
and look for the  
x-intercepts.

use 2nd  $\rightarrow$  calc  $\rightarrow$  zero

$$x \approx -0.2857.$$

ex:  $6.8x^2 - 4.9x - 2.6 = 0$

Graph  $y = 6.8x^2 - 4.9x - 2.6$

$$x \approx -0.3554 \text{ or } x \approx 1.0764$$