

Solving Quadratic Equations

Section 1.6

Quadratic Equations

- Standard form $ax^2 + bx + c = 0$
- Solutions are called zeros or roots (where crosses the x-axis)
- 3 methods to solve quadratic equations
 - 1) Factor
 - 2) Complete the square
 - 3) Quadratic Formula

Examples

Factor.

~~a·c~~
~~b~~

1) $x^2 - 5x - 14 = 0$

product: -14
sum: -5

~~-7~~ ~~2~~

$a=1$ write the factors

$(x+2)(x-7) = 0$

$x+2=0$ $x-7=0$

$x=-2$ $x=7$

x-int.

GCF

2) $16m^2 - 24m = 0$

$8m(2m-3) = 0$

$2m-3=0$
 $+3 \quad +3$

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

$8m=0$
 $\frac{8}{8} \quad \frac{8}{8}$

 $m=0$

Alg III 1.6 lesson

Factor.

$$3) \quad (3x - 2)(x + 4) = -11$$

+11 +11

$$(3x-2)(x+4) + 11 = 0$$

FOIL

$$\underline{3x^2} + \underline{12x} - \underline{2x} - 8 + 11 = 0$$

$$a \cdot c \quad 3x^2 + 10x + 3 = 0$$

$a \neq 1$ Group/rewrite x-terms

$$\underline{3x^2 + 9x} + \underline{1x + 3} = 0$$

GCF $3x(x+3) + 1(x+3)$

$$\boxed{(x+3)(3x+1) = 0}$$

To solve
Set each
= 0

Examples

Complete the square.

$$1) \quad x^2 - 10x + 14 = 0$$

-14 -14

$$\underline{x^2 - 10x + 25} = -14 + 25$$

$$\left(\frac{-10}{2}\right)^2 = \left(-5\right)^2 = 25$$

$$(x-5)^2 = 11$$

$$\sqrt{(x-5)^2} = \pm \sqrt{11}$$

$$x-5 = \pm \sqrt{11}$$

+5 +5

$$\boxed{x = 5 \pm \sqrt{11}}$$

$$2) \quad m^2 + 8m = -30$$

$$\left(\frac{8}{2}\right)^2 = (4)^2 = 16$$

$$m^2 + 8m + 16 = -30 + 16$$

$$\sqrt{(m+4)^2} = \sqrt{-14}$$

$$m+4 = \pm i\sqrt{14}$$

-4 -4

$$\boxed{m = -4 \pm i\sqrt{14}}$$

Complete the square.

$$3) \quad 4w^2 - 8w - 32 = 0$$

$$4w^2 - 8w = 32$$

$$4(w^2 - 2w + 1) = 32 + 4$$

$$\left(\frac{-2}{2}\right)^2 = \left(\underline{-1}\right)^2 = 1$$

$$\frac{4}{4}(w-1)^2 = \frac{36}{4}$$

$$\sqrt{(w-1)^2} = \sqrt{9}$$

$$w-1 = \pm 3$$

$$w = 1 \pm 3$$

$$w = 1+3 = 4 \quad w = 1-3 = -2$$

Quadratic Formula

$$\text{when } ax^2 + bx + c = 0$$

Examples

Solve using the quadratic formula.

$$1) \quad 4x^2 - x - 7 = 0$$