

Solving Quadratic Equations

Solve.

a. $x^2 + 7x + 12 = 0$ ① Factor

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

$$\begin{array}{r} 12 \\ 1 \cdot 12 \\ 2 \cdot 6 \\ \hline 3 \cdot 4 \end{array}$$

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

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

Zero product property.

If $ab=0$, then $a=0$ or $b=0$

Check:

$$\begin{array}{l} (-3)^2 + 7(-3) + 12 = 0 \\ 9 - 21 + 12 \\ -12 + 12 \\ 0 = 0 \\ \checkmark \end{array}$$

$$\begin{array}{l} (-4)^2 + 7(-4) + 12 = 0 \\ 16 - 28 + 12 = 0 \\ -28 + 28 \\ 0 = 0 \end{array}$$

b. $x^2 - 7x - 18 = 0$

$$\begin{array}{r} 1 \cdot 18 \\ 2 \cdot 9 \\ \hline 3 \cdot 6 \end{array}$$

$$(x+2)(x-9) = 0$$

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

$$\begin{array}{r} x-9=0 \\ +9 \quad +9 \\ \hline x=9 \end{array}$$

c. $x^2 - 16 = 0$

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

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

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

d. $9x^2 - 12x = -4$

* Equations with x^2 and x need to equal 0.

$$\begin{array}{r} 9x^2 - 12x = -4 \\ +4 \quad +4 \\ \hline 9x^2 - 12x + 4 = 0 \end{array}$$

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

$$\begin{array}{r} 3x-2=0 \\ +2 \quad +2 \\ \hline 3x=2 \end{array}$$

$$3x-2=0$$

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

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

e. $\frac{5x^2}{5x} - \frac{15x}{5x} = 0$

$5x(x - 3) = 0$

$\frac{5x}{5} = \frac{0}{5}$

$x = 0$

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

$x = 3$

12
84
1.84
2.42
3.28
4.8
6.4
7.12

f. $12x^2 - 25x - 7 = 0$

$x^2 - 25x - 84 = 0$

$(x + \frac{3}{12})(x - \frac{28}{12}) = 0$

$(x + \frac{1}{4})(x - \frac{7}{3}) = 0$

$(4x + 1)(3x - 7) = 0$

$\frac{4x+1}{-1 \quad -1} = 0$

$\frac{4x}{4} = \frac{1}{4}$

$x = -\frac{1}{4}$

$\frac{3x-7}{+7 \quad +7} = 0$

$\frac{3x}{3} = \frac{7}{3}$

$x = \frac{7}{3}$

g. $2x^2 - 7x - 9 = 0$

$x^2 - 7x - 18 = 0$

1.18
2.9
3.4

$(x + \frac{2}{2})(x - \frac{9}{2}) = 0$

$(x + 1)(2x - 9) = 0$

$\frac{x+1}{-1 \quad -1} = 0$

$x = -1$

$\frac{2x-9}{+9 \quad +9} = 0$

$\frac{2x}{2} = \frac{9}{2}$

$x = \frac{9}{2}$

Quadratic Formula

a. $2x^2 - 8x + 9 = 0$

$a = 2$
 $b = -8$
 $c = 9$

$\frac{18}{1.18}$
 $\frac{2.9}{3.6}$

$ax^2 + bx + c = 0$

$x = \frac{8 \pm \sqrt{64 - 4(2)(9)}}{2 \cdot 2}$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$x = \frac{8 \pm \sqrt{-8}}{4}$ $\sqrt{-1} = i$

$= \frac{8 \pm 2i\sqrt{2}}{4}$
 $= \frac{2(4 \pm i\sqrt{2})}{2 \cdot 2}$

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

$a = 1$
 $b = 5$
 $c = -3$

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

$x = \frac{-5 \pm \sqrt{25 - 4(1)(-3)}}{2 \cdot 1}$

$x = \frac{-5 \pm \sqrt{37}}{2}$

$\frac{-5 + \sqrt{37}}{2},$