Skills Review

Learning Objectives

1. Solve a Linear Equation or Equations That Lead to Linear Equations
2. Solve Problems That Can Be Modeled by Linear Equations
3. Solve a Quadratic Equation by Factoring, Completing the Square, Square Root Method, or Quadratic Formula
4. Solve Problems That Can Be Modeled by Quadratic Equations

Example

D: $(-2, \infty)$

Solve the equation:

$$5x - (7x - 4) - 2 = 5 - (3x + 2)$$

$$5x - 7x + 4 - 2 = 5 - 3x - 2$$

$$-2x + 2 = 3 - 3x$$

$$x + 2 = 3$$

$$\boxed{x = 1}$$

Example

D: $(-\infty, \infty)$

Solve the equation:

$$(2y+1)(y-1)=(y+5)(2y-5)$$

$$2y^2 - y - 1 = 2y^2 + 5y - 25$$

$$-y - 1 = 5y - 25$$

$$24 = 6y$$

$$y = 4$$

Example

Solve the equation:

$$\frac{2}{3x}+\frac{1}{2}=\frac{4}{x}+\frac{4}{3}$$

Domain: $x \neq 0$

multiply by LCD. $6x$

$$\frac{12x}{3x}+\frac{6x}{2}=\frac{24x}{x}+\frac{24x}{3}$$

$$4+3x=24+8x$$

$$-20=5x$$

$$x=-4$$

Example

Domain: $x \neq -6, 0$

L.C.D. $3 \cdot 2 \cdot x \cdot (x+6)$

$6x(x+6)$

Solve the equation:

$$\frac{1}{3x+18} - \frac{1}{2x+12} = \frac{2}{x^2+6x}$$

$$\frac{6x(x+6)}{1}\left[\frac{1}{3(x+6)} - \frac{1}{2(x+6)} = \frac{2}{x(x+6)}\right]$$

$$\frac{6x(x+6)}{3(x+6)} - \frac{6x(x+6)}{2(x+6)} = \frac{12x(x+6)}{x(x+6)}$$

$$2x - 3x = 12$$

$$-x = 12 \rightarrow x = -12$$

Example

LCD: $x-1$

Domain: $x \neq 1$

Solve the equation:

$$\frac{x-1}{1}\left[\frac{3x}{x-1}+2=\frac{3}{x-1}\right]$$

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

$$3x+2x-2=3$$

$$5x-2=3$$

$$5x=5$$

$$x=1$$

$\emptyset$

Example

Investments

A total of $18,000 is invested, some in stocks and some in bonds. If the amount invested in bonds is half that invested in stocks, how much is invested in each category?

x = # in bonds

$2x$ = # in stocks

$2x + x = 18000$

$3x = 18000$

$x = 6000$ in bonds

12000 in stocks

x = # in stocks

$\frac{1}{2}x$ = $ in bonds

$x + \frac{1}{2}x = 18000$

$1\frac{1}{2}x = 18000$

$\rightarrow x = \$12000$ in stocks

$6000 in bonds

Example

Solving a Quadratic Equation by Factoring

Solve the equations:

(a) $x^2 + 6x = 0$ → $x(x+6) = 0$

$x = 0$ or $x + 6 = 0$

$x = -6, 0$

(b) $2x^2 = x + 3$

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

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

$2x - 3 = 0$ or $x + 1 = 0$

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

$x = 3/2$

$x = 3/2, -1$

Example

Solving a Quadratic Equation Using the Square Root Method ("Short cut")

Solve each equation.

(a) $x^2 = 5$

(b) $(x-2)^2 = 16$

(a) $\sqrt{x^2} = \sqrt{5}$

$x = \pm\sqrt{5}$

$x - 2 = \pm 4$

$x = 2 \pm 4$

$x = 6, -2$

Example

x^2+bx+c $\left(\frac{b}{2}\right)^2$

Solving a Quadratic Equation by Completing the Square

$$x^2 + 8x - 1 = 0$$

$x^2+8x+16 = 1+16$

$(x+4)(x+4) = 17$

$(x+4)^2 = \sqrt{17}$

$x+4 = \pm\sqrt{17}$

$x = -4 \pm \sqrt{17}$

If $ax^2+bx+c=0$

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

Example

Solving a Quadratic Equation Using the Quadratic Formula

Find the real solutions, if any, of the equation

$$3x^2 - 5x + 1 = 0$$

$$x = \frac{5 \pm \sqrt{25 - 12}}{6} = \frac{5 \pm \sqrt{13}}{6}$$

Example

Solving a Quadratic Equation Using the Quadratic Formula

Find the real solutions, if any, of the equation

$$3x^2 + 2 = 4x$$

$$3x^2 - 4x + 2 = 0$$

$$x = \frac{4 \pm \sqrt{16 - 24}}{6} = \frac{4 \pm \sqrt{-8}}{6}$$

$$= \frac{4 \pm 2i\sqrt{2}}{6} = \boxed{\frac{2 \pm i\sqrt{2}}{3}}$$

No real solutions!

Example

A projectile is launched from the top of a 100 foot building at an initial velocity of 58 ft/sec. Its path can be modeled by the equation

$$s = 100 + 58t - 16t^2$$

where *s* is the height in feet and *t* is the time in seconds.

a) When will the projectile reach a height of 150 feet?

b) When will the projectile hit the ground? $s = 0$

a) $S = 100 + 58t - 16t^2$

$150 = 100 + 58t - 16t^2$

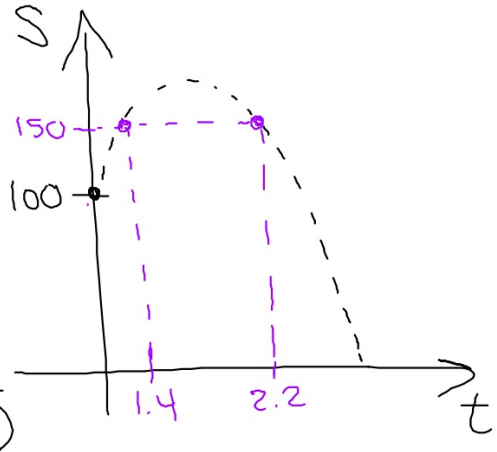
$-150 \quad -150$

$0 = -50 + 58t - 16t^2$

$c \quad b \quad a$

$$t = \frac{-58 \pm \sqrt{58^2 - 4(-16)(-50)}}{2(-16)}$$

$$t \approx \frac{-58 \pm 12.81}{-32} \approx 1.412 \text{ OR } 2.213$$



b) $-16t^2 + 58t + 100 = 0$

$$t = \frac{-58 \pm \sqrt{58^2 - 4(-16)(100)}}{2(-16)} \approx \frac{-58 \pm 98.813}{-32}$$

$t \approx -1.275$ OR 4.9

4.9 seconds until it hits the ground