

9.6 Solving Rational Expressions

Practice

Solve the equation by multiplying everything by the LCD.

1.  $\frac{3}{x} - \frac{2}{x+1} = \frac{4}{x}$   $x \neq 0, -1$  LCD:  $x(x+1)$

~~$\frac{x(x+1)3}{x} - \frac{x(x+1)2}{x+1} = \frac{x(x+1)4}{x}$~~

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

~~$\frac{3+x}{-3} = \frac{4(x+1)}{-3}$~~   
 $\frac{3+x}{-3} = \frac{4x+4}{-3}$   
 $3+x = 4x+4$   
 $-3x = 1$   
 $x = -\frac{1}{3}$  {-1/3}

2.  $\frac{15}{x} - 4 = \frac{6}{x} + 3$   $x \neq 0$  LCD:  $x$

~~$\frac{(x)15}{x} - (x)4 = \frac{(x)6}{x} + (x)3$~~

$15 - 4x = 6 + 3x$   
 $-15 - 3x - 15 - 3x$

{9/7}

$\frac{-7x}{-7} = \frac{-9}{-7}$   $x = \frac{9}{7}$

3.  $\frac{1}{x+2} + \frac{1}{x+2} = \frac{4}{x^2-4}$   $x \neq \pm 2$  LCD:  $(x+2)(x-2)$

~~$\frac{1(x-2)}{x+2} + \frac{1(x-2)}{x+2} = \frac{4}{(x+2)(x-2)}$~~

$x-2 + x-2 = 4$

$2x-4 = 4$

$2x = 8$

$x = 4$

{4}

4.  $\frac{x}{x-4} + 1 = \frac{4}{x-4}$   $x \neq 4$  LCD:  $(x-4)$

~~$\frac{(x-4)x}{x-4} + (x-4)1 = \frac{(x-4)4}{x-4}$~~

$x + x - 4 = 4$

$2x - 4 = 4$

$\frac{2x}{2} = \frac{8}{2}$   $x = 4$

{ } (empty)

5.  $\frac{4}{x} - \frac{1}{x+2} = \frac{2}{x}$   $x \neq 0, -2$  LCD:  $x(x+2)$

~~$\frac{x(x+2)4}{x} - \frac{x(x+2)1}{x+2} = \frac{x(x+2)2}{x}$~~

$4x+8 - x = 2x+4$

$3x+8 = 2x+4$

$-2x - 2x$

$x+8 = 4$

$-8 - 8$

$x = -4$

{-4}

Solve the equation by cross multiplying.

~~$x = \frac{-4 \pm \sqrt{16 + 4(12)}}{2}$~~

6.  $\frac{2x-3}{x+3} = \frac{3x}{x+4}$   $x \neq -3, -4$

~~$= \frac{-4 \pm \sqrt{32}}{2}$~~

~~$\frac{x}{2x+1} = \frac{5}{4-x}$~~

~~$x \neq -\frac{1}{2}, 4$~~

~~$(2x-3)(x+4) = 3x(x+3)$~~

~~$x(4-x) = 5(2x+1)$~~

~~$2x^2 + 8x - 3x - 12 = 3x^2 + 9x$~~

~~$4x - x^2 = 10x + 5$~~

~~$2x^2 + 5x - 12 = 3x^2 + 9x$~~

~~$0 = x^2 + 6x + 5$~~

~~$0 = (x+1)(x+5)$~~

~~$-x^2 - 4x - 12 = 0$~~

~~$x^2 + 4x + 12 = 0$~~

{-2 ± 2√2}

{-1, -5}

$$8. \frac{x}{x-3} = \frac{6}{x-3} \quad x \neq 3$$

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

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

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

$$(x-3)(x-6) \quad \boxed{\{6\}}$$

$$10. \frac{7x}{x+3} = \frac{x}{4} \quad x \neq -3$$

$$28 = x^2 + 3x$$

$$0 = x^2 + 3x - 28$$

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

$$\boxed{\{-7, 4\}}$$

Solve using any method.

$$11. \frac{2x-4}{x-4} = \frac{4}{x-4} \quad x \neq 4$$

$$4x - 16 = (2x-4)(x-4)$$

$$4x - 16 = 2x^2 - 8x - 4x + 16$$

$$4x - 16 = 2x^2 - 12x + 16$$

$$\begin{array}{r} 4x - 16 \\ +16 \\ \hline 4x = 2x^2 - 12x + 32 \\ -4x \quad -4x \\ \hline 0 = 2x^2 - 16x + 32 \end{array}$$

$$0 = 2x^2 - 16x + 32$$

$$0 = x^2 - 8x + 16$$

$$0 = (x-4)^2$$

$$\boxed{\emptyset}$$

$$13. \frac{3x-1}{x-2} + 3 = \frac{x}{x-2} \quad x \neq 2$$

$$LCD: x-2$$

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

$$3x-1 + 3x-6 = x$$

$$6x-7 = x$$

$$5x = 7$$

$$x = \frac{7}{5}$$

$$\boxed{\left\{\frac{7}{5}\right\}}$$

$$9. -\frac{2}{x-1} = \frac{x-8}{x+1} \quad x \neq \pm 1$$

$$-2(x+1) = (x-1)(x-8)$$

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

$$+2$$

$$+2$$

$$-2x = x^2 - 9x + 10$$

$$+2x$$

$$+2x$$

$$0 = x^2 - 7x + 10$$

$$0 = (x-2)(x-5)$$

$$x=2 \quad x=5$$

$$\boxed{\{2, 5\}}$$

$$12. \frac{1}{x-2} + \frac{1}{x+3} = \frac{5}{x^2+x-6} \quad x \neq 2, -3$$

$$LCD: (x+3)(x-2)$$

$$\frac{1}{x-2} + \frac{1}{x+3} = \frac{5}{(x+3)(x-2)}$$

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

$$2x + 1 = 5$$

$$2x = 4$$

$$x = 2$$

$$\boxed{\emptyset}$$