# Algebra 1

# Section 11.5

Students will be able to solve rational equations and proportions.

A **rational equation** is an equation that contains one or more rational expressions.

You can solve a rational equation by first multiplying each side of the equation by the LCD. When each side of a rational equation is a single rational expression, you can solve the equation using the Cross Product Property.

You can clear the fractions from the equation by multiplying by a common denominator. Then check your solution!

$$12x\left(\frac{5}{12} - \frac{1}{2x} = \frac{1}{3x}\right)$$

$$\frac{12x(5)}{12} - \frac{12x}{2x} = \frac{12x}{3x}$$

$$5x - 6 = 4$$

$$5x = 10$$

$$x = 2 \checkmark$$

What is the solution of each equation? Check your solution.

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

$$\frac{3x}{3} + \frac{9x}{x} = \frac{6x}{x}$$

$$x + 9 = 6$$

$$x = -3 \checkmark$$

What is the solution of each equation? Check your solution.

$21x\left(\frac{4}{7x} + \frac{1}{3} = \frac{7}{3x}\right)$

$\frac{21x(4)}{7x} + \frac{21x}{3} = \frac{21x(7)}{3x}$

$12 + 7x = 49$

$7x = 37$

$x = \frac{37}{7}$ ✓

What is the solution of each equation? Check your solution.

$\frac{10x}{1}\left(\frac{2}{5x} - \frac{1}{2x} = -\frac{1}{2}\right)$

$\frac{20x}{5x} - \frac{10x}{2x} = -\frac{10x}{2}$

$4 - 5 = -5x$

$-1 = -5x$

$x = \frac{1}{5}$ ✓

What is the solution? Cross Multiply

$\frac{10}{6x + 7} \times \frac{6}{2x + 9}$ $\quad 6(6x+7) = 10(2x+9)$

$36x + 42 = 20x + 90$

$-20x \quad -20x$

$16x + 42 = 90$

$-42 \quad -42$

$16x = 48$

$x = 3$ ✓

What is the solution?

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

$x - 3 = 1$

$x = 4$ ✓

What is the solution?

$\frac{x-4}{x^2-4} \cdot \frac{-2}{x-2}$ $(x-2)(x-4) = -2(x^2-4)$

FOIL

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

$x^2-6x+8 = -2x^2+8$

$+2x^2 \quad -8 \quad +2x^2-8$

$3x^2-6x=0$ $3x=0$ $x=0$✓

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

What is the solution?

$\frac{c}{3} = \frac{7}{c-4}$

$c(c-4)=21$

$c^2-4c=21$

$c^2-4c-21=0$

$(c-7)(c+3)=0$

$c-7=0 \quad c+3=0$

$c=7$✓ $c=-3$✓

What is the solution? Check your solutions.

$\frac{3}{b+2} = \frac{5}{b-2}$

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

$3b-6=5b+10$

$-3b \quad -3b$

$-6=2b+10$

$-10 \quad -10$

$-16=2b$

$b=-8$✓

What are the solutions?

$x^2\left(1-\frac{2}{x}=\frac{8}{x^2}\right)$

$x^2-\frac{2x^2}{x}=\frac{8x^2}{x^2}$

$x^2-2x=8$

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

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

$x-4=0 \quad x+2=0$

$x=4$✓ $x=-2$✓

You can mow the lawn in 1 hour 15 min (75 min) using a push mower. Your father can mow the lawn in 30 minutes on a riding mower. How long would it take you and your father to mow the lawn together?

$150\left(\frac{x}{75}+\frac{x}{30}=1\right)$ $\frac{150x}{75}+\frac{150x}{30}=150$

$2x+5x=150$

$\frac{7x}{7}=\frac{150}{7}$ $x\approx 21.4$ min

One hose can fill a pool in 12h. Another hose can fill the same pool in 8h. How long will it take for both hoses to fill the pool together?

$24\left(\frac{x}{12}+\frac{x}{8}=1\right)$ $\frac{24x}{12}+\frac{24x}{8}=24$

$2x+3x=24$

$5x=24$

$x\approx 4.8$ hr

**11.5 Homework:**

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**#1-4 all, 8-13 all, 23-30 all**