

Solving Rational Equations

Solve for x and check for excluded values.

1. $\frac{2}{x-2} - \frac{2x}{3} = \frac{x-3}{3}$

Exc
 $x-2 \neq 0$
 $x \neq 2$

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

~~$6 - 2x^2 + 4x = x^2 - 5x + 6$~~

$0 = 3x^2 - 9x$

$0 = 3x(x-3)$

$3x=0 \quad x-3=0$

$x=0, 3$

2. $1 + \frac{3}{x-3} = \frac{4}{x^2-9}$

Exc
 $x^2-9 \neq 0$
 $x^2 \neq 9$
 $x \neq \pm 3$

$\frac{x^2-9}{x^2-9} + \frac{3(x+3)}{(x-3)(x+3)} = \frac{4}{x^2-9}$

~~$x^2 - 9 + 3x + 9 = 4$~~

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

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

$x = -4, 1$

3. $\frac{x}{x-1} = \frac{2x+10}{x+11}$

Exc
 $x-1 \neq 0$
 $x \neq 1$
 $x+11 \neq 0$
 $x \neq -11$

$\frac{x(x+11)}{(x-1)(x+11)} = \frac{(2x+10)(x-1)}{(x+11)(x-1)}$

$x^2 + 11x = 2x^2 + 8x - 10$

$0 = x^2 - 3x - 10$

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

$x = 5, -2$

4. $\frac{4x}{x-5} = \frac{20}{x-5}$

Exc
 $x-5 \neq 0$
 $x \neq 5$

~~$4x = 20$~~

~~$x = 5$~~

No Solution

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

Exc

$$x \neq 0$$

$$x \neq -2$$

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

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

$$3x+8 = 2x+4$$

$$x = -4$$

$$6. \frac{1}{x-5} - \frac{1}{x+5} = \frac{x+3}{x^2-25}$$

Exc

$$x^2 - 25 \neq 0$$

$$x^2 \neq 25$$

$$x \neq \pm 5$$

$$\frac{1(x+5)}{(x-5)(x+5)} - \frac{1(x-5)}{(x+5)(x-5)} = \frac{x+3}{x^2-25}$$

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

$$x+5 - x + 5 = x+3$$

$$10 = x+3$$

$$x = 7$$

$$7. \frac{x}{x-4} + 1 = \frac{4}{x-4}$$

Exc

$$x-4 \neq 0$$

$$x \neq 4$$

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

$$x + x - 4 = 4$$

$$2x = 8$$

$$x = 4$$

No Solution

$$8. \frac{x}{x+2} + \frac{2}{x^2+5x+6} = \frac{15}{x+3}$$

Exc

$$(x+3)(x+2) \neq 0$$

$$x \neq -3, -2$$

$$\frac{x(x+3)}{(x+2)(x+3)} + \frac{2}{x^2+5x+6} = \frac{15(x+2)}{(x+3)(x+2)}$$

$$x^2 + 3x + 2 = 15x + 30$$

$$x^2 - 12x - 28 = 0$$

$$(x-14)(x+2) = 0$$

$$x = 14, -2$$

$$x = 14$$