

Simplify.

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

$$2. \frac{x^2-7x+12}{x^2-x-6} \div \frac{x^2+x-2}{x^2-x}$$

$$\frac{\cancel{(x-4)}\cancel{(x-3)}}{\cancel{(x-3)}(x+2)} \cdot \frac{x\cancel{(x-1)}}{\cancel{(x+2)}(x+1)}$$

$$\boxed{\frac{x(x-4)}{(x+2)^2}}$$

$$3. \frac{2}{1-4x^2} - \frac{1}{1-2x} \frac{(1+2x)}{(1+2x)}$$

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

$$\boxed{\frac{1}{1+2x}}$$

$$4. \frac{(x+y)1}{(x+y)(x-y)} + \frac{2x-y}{x^2-y^2}$$

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

$$5. \frac{\left(x^2+3+\frac{2}{x}\right)x^2}{\left(1-\frac{4}{x^2}\right)x^2} =$$

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

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

$$6. \frac{1-\frac{4}{x+1}}{1-\frac{2}{x-1}} \frac{(x+1)(x-1)}{(x+1)(x-1)}$$

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

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

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

Solve each equation. Identify any extraneous solutions.

$$7 \left(\frac{x}{x-3} - \frac{7}{x+5} = \frac{24}{x^2+2x-15} \right) (x+5)(x-3) \quad D: x \neq 3, -5$$

$$x(x+5) - 7(x-3) = 24$$

$$x^2 + 5x - 7x + 21 = 24$$

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

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

$$x = 3, -1$$

$$x = -1$$

3 is extraneous

$$9 \left(\frac{5x}{x-5} + \frac{4}{x+6} = \frac{54x+5}{x^2+x-30} \right) (x+6)(x-5) \quad D: x \neq -6, 5$$

$$5x(x+6) + 4(x-5) = 54x+5$$

$$5x^2 + 30x + 4x - 20 = 54x + 5$$

$$5x^2 + 34x - 20 = 54x + 5$$

$$5x^2 - 20x - 25 = 0$$

$$5(x^2 - 4x - 5) = 0$$

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

$$x = 5, -1$$

$$x = -1$$

5 is extraneous

$$8 \left(\frac{x+2}{x-3} + \frac{x-2}{x-6} = 2 \right) (x-3)(x-6) \quad D: x \neq 3, 6$$

$$(x+2)(x-6) + (x-2)(x-3) = 2(x-3)(x-6)$$

$$x^2 - 4x - 12 + x^2 - 5x + 6 = 2(x^2 - 9x + 18)$$

$$2x^2 - 9x - 6 = 2x^2 - 18x + 36$$

$$9x = 42$$

$$x = 42/9$$

$$10 \left(\frac{4x}{x^2-9} - \frac{x-1}{x^2-6x+9} = \frac{2}{x+3} \right) (x+3)(x-3)(x-3) \quad D: x \neq \pm 3$$

$$4x(x-3) - (x-1)(x+3) = 2(x-3)(x-3)$$

$$4x^2 - 12x - (x^2 + 2x - 3) = 2(x^2 - 6x + 9)$$

$$4x^2 - 12x - x^2 - 2x + 3 = 2x^2 - 12x + 18$$

$$3x^2 - 14x + 3 = 2x^2 - 12x + 18$$

$$x^2 - 2x - 15 = 0$$

$$(x-5)(x+3) = 0$$

$$x = 5, -3$$

$$x = 5$$

-3 is extraneous