

Solve each equation. Check your answers.

$$1) \left(\frac{1}{2x} = \frac{6}{x} + \frac{1}{2} \right) 2x$$

$$1 = 12 + x$$

$$\boxed{-11 = x}$$

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

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

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

$$1 = 6 + x$$

$$\boxed{-5 = x}$$

$$3) \frac{5}{2x-2} = \frac{15}{x^2-1}$$

$$5x^2 - 5 = 30x - 30$$

$$5x^2 - 30x + 25 = 0$$

$$5(x^2 - 6x + 5) = 0$$

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

$$x = \cancel{1}, \boxed{5}$$

$$4) \left(1 = \frac{1}{x^2} + \frac{4x^2 + 20x - 24}{x^2} \right) x^2$$

$$x^2 = 1 + 4x^2 + 20x - 24$$

$$0 = 3x^2 + 20x - 23$$

$$0 = (3x + 23)(x - 1)$$

$$\boxed{x = -23/3, 1}$$

$$5) \frac{4}{x-3} = \frac{2}{x+1} + \frac{16}{x^2-2x-3}$$

$$\left(\frac{4}{x-3} = \frac{2}{x+1} + \frac{16}{(x-3)(x+1)} \right) (x-3)(x+1)$$

$$4(x+1) = 2(x-3) + 16$$

$$4x+4 = 2x-6+16$$

$$2x = 6$$

$$x = 3$$

NO SOLUTION

$$6) \frac{1}{2x+2} + \frac{5}{x^2-1} = \frac{1}{x-1}$$

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

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

$$x-1 + 10 = 2x+2$$

$$\boxed{7 = x}$$

$$7) \left(\frac{x+5}{3x^2} = \frac{5}{3x} + \frac{x^2-4x+3}{x^2} \right) 3x^2$$

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

$$6x+5 = 5x + 3x^2 - 12x + 9$$

$$0 = 3x^2 - 13x + 4$$

$$0 = (3x-1)(x-4)$$

$$x = 1/3, 4$$

$$8) \frac{x-3}{x} = \frac{1}{x+1} + \frac{1}{x^2+x}$$

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

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

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

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

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

$$x = \boxed{4}, \cancel{x}$$