

Solve each equation.

1.  $\frac{4}{2x-3} = \frac{x}{5}$

$$20 = 2x^2 - 3x$$

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

$$0 = 2x^2 - 8x + 5x - 20$$

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

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

$$x-4=0 \quad 2x+5=0$$

$$x=4 \quad x=-\frac{5}{2}$$

2.  $\frac{1 \cdot 5x}{3 \cdot 5x} = \frac{3 \cdot 3}{5x \cdot 3} - \frac{4 \cdot 5}{3x \cdot 5}$

$$\frac{5x}{15x} = \frac{9-20}{15x}$$

$$5x = -11$$

$$x = -\frac{11}{5}$$

3.  $\frac{1}{x} + \frac{3x+12}{x^2-5x} = \frac{7x-56}{x^2-5x}$

$$\frac{1 \cdot (x-5)}{x \cdot (x-5)} + \frac{3x+12}{x(x-5)} = \frac{7x-56}{x(x-5)}$$

$$\frac{1(x-5) + 3x + 12}{x(x-5)} = \frac{7x-56}{x(x-5)}$$

$$1(x-5) + 3x + 12 = 7x - 56$$

$$4x + 7 = 7x - 56$$

$$63 = 3x$$

$$21 = x$$

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

$$\frac{1(x-1) + 10(x-1)}{2x(x-1)} = \frac{6x}{2x(x-1)}$$

$$x-1 + 10x-10 = 6x$$

$$11x-11 = 6x$$

$$5x = 11$$

$$x = \frac{11}{5}$$

4.  $\frac{1}{x-2} + \frac{1}{x^2-7x+10} = \frac{6}{x-2}$

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

$$1(x-5) + 1 = 6(x-5)$$

$$1x - 4 = 6x - 30$$

$$26 = 5x$$

$$\frac{26}{5} = x$$

8.  $\frac{6}{x-1} = \frac{4}{x-2} + \frac{8}{x-1}$

$$\frac{6(x-2)}{(x-1)(x-2)} = \frac{4(x-1) + 8(x-2)}{(x-2)(x-1)}$$

$$6(x-2) = 4(x-1) + 8(x-2)$$

$$6x-12 = 4x-4 + 8x-16$$

$$6x-12 = 12x-20$$

$$8 = 6x$$

$$\frac{8}{6} = x$$

$$\frac{4}{3} = x$$

$$10. \frac{3}{x-3} + \frac{4}{x-4} = \frac{25}{x^2-7x+12}$$

$$\frac{3(x-4)+4(x-3)}{(x-3)(x-4)} = \frac{25}{(x-4)(x-3)}$$

$$3(x-4)+4(x-3)=25$$

$$3x-12+4x-12=25$$

$$7x-24=25$$

$$7x=49$$

$$x=7$$

$$12. \frac{1}{2x+2} + \frac{51}{x^2-1} = \frac{1}{x-1}$$

$$\frac{1}{2(x+1)} + \frac{51}{(x-1)(x+1)} = \frac{1}{x-1}$$

$$\frac{1(x-1)+51(2)}{2(x+1)(x-1)} = \frac{1(2)(x+1)}{2(x+1)(x-1)}$$

$$1(x-1)+51(2)=2(x+1)$$

$$x-1+102=2x+2$$

$$99=x$$

Perform the indicated operation and simplify.

$$14. \frac{x-4}{x^2-16} \div \frac{4x-16}{x^2+5x+4}$$

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

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

$$16. \frac{10x^2-20x}{40x^3-80x^2} \cdot \frac{16x^3+80x^2}{6x+30}$$

$$\frac{\cancel{5}10\cancel{x^2}(x-2)}{\cancel{5}40\cancel{x^2}(x-2)} \cdot \frac{\cancel{2}16\cancel{x^3}(x+5)}{\cancel{3}6(x+5)}$$

$$\frac{2x}{3}$$

$$18. \frac{2x^3+10x^2+12x}{2x^2+10x} \cdot \frac{4x-12}{x^2-9}$$

$$\frac{2x(x^2+5x+6)}{2x(x+5)} \cdot \frac{4(x-3)}{(x+3)(x-3)}$$

$$\frac{\cancel{2}x(x+2)(x+3)}{\cancel{2}x(x+5)} \cdot \frac{4\cancel{(x-3)}}{(x+3)\cancel{(x-3)}}$$

$$\frac{4(x+2)}{x+5}$$

$$20. \frac{\frac{x+7}{x^2-9}}{\frac{x^2+9x+14}{3x^2-9x}}$$

$$\frac{\cancel{x+7}}{(x-3)(x+3)} \cdot \frac{3x\cancel{(x-3)}}{(x+7)(x+2)}$$

$$\frac{3x}{(x+3)(x+2)}$$



$$22. \frac{5x}{x^2-7x} - \frac{4}{2x-14}$$

$$2 \cdot \frac{5x}{x(x-7)} - \frac{4 \cdot x}{2(x-7) \cdot x}$$

$$\frac{10x - 4x}{2x(x-7)}$$

$$\frac{3 \cancel{6x}}{\cancel{2}x(x-7)}$$

$$\boxed{\frac{3}{x-7}}$$

$$26. \frac{3x+2}{x^2-2x-3} + \frac{x+1}{x-3}$$

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

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

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

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

$$24. \frac{4x+1}{x^2-4} - \frac{3}{x-2}$$

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

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

$$\frac{4x+1 - 3x - 6}{(x-2)(x+2)}$$

$$\boxed{\frac{x-5}{(x-2)(x+2)}}$$

$$28. \frac{2x}{x^2+8x+15} - \frac{x-3}{x+5}$$

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

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

$$\frac{2x - (x^2+3x-3x-9)}{(x+5)(x+3)}$$

$$\frac{2x - x^2 - 3x + 3x + 9}{(x+5)(x+3)}$$

$$\boxed{\frac{-x^2+2x+9}{(x+5)(x+3)}}$$

Retro Question - Evaluate.

30. Given  $f(x) = 2x^2 - 5x + 3$  and  $g(x) = -x^2 + 2x - 7$ , find:

a.)  $g(-3)$

$$-(-3)^2 + 2(-3) - 7$$

$$-9 + -6 - 7$$

$$\boxed{-22}$$

b.)  $f(m-4)$

$$2(m-4)^2 - 5(m-4) + 3$$

$$2(m-4)(m-4) - 5m + 20 + 3$$

$$2(m^2 - 8m + 16) - 5m + 23$$

$$2m^2 - 16m + 32 - 5m + 23$$

$$\boxed{2m^2 - 21m + 55}$$

c.)  $f(g(2))$

$$g(2) = -2^2 + 2(2) - 7 = -7$$

$$f(-7)$$

$$2(-7)^2 - 5(-7) + 3$$

$$\boxed{136}$$

