

Simplify the following rational expressions.

$$1. \frac{x-y}{y-x} = \frac{-(y-x)}{y-x} = -1.$$

$$2. \frac{4x+8}{x+2} = \frac{4(x+2)}{x+2} = 4.$$

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

$$4. \frac{x^2-2x-15}{x^2+10x+21} = \frac{(x-5)(x+3)}{(x+7)(x+3)} = \frac{x-5}{x+7}.$$

$$5. \frac{x^2-36}{x^2+12x+36} = \frac{(x-6)(x+6)}{(x+6)^2} = \frac{x-6}{x+6}.$$

$$6. \frac{6x^2-5x-1}{10x^2+9x-19} = \frac{(6x+1)(x-1)}{(10x+19)(x-1)} = \frac{6x+1}{10x+19}.$$

$$7. \frac{6x-12}{x+3} \cdot \frac{4x+12}{3x-6} = \frac{6(x-2) \cdot 4(x+3)}{(x+3) \cdot 3(x-2)} = \frac{24(x+3)(x-2)}{3(x+3)(x-2)} = \frac{24}{3} = 8.$$

$$8. \frac{x^2+x-6}{x^2+3x-4} \cdot \frac{x^2-6x+5}{x^2-2x-15} = \frac{(x+3)(x-2) \cdot (x-1)(x-5)}{(x+4)(x-1) \cdot (x-5)(x+3)} = \frac{x-2}{x+4}.$$

$$9. \frac{x^2-x-2}{x^2+8x+15} \cdot \frac{x^2-x-12}{x^2-9x+14} = \frac{(x-2)(x+1) \cdot (x-4)(x+3)}{(x+5)(x+3) \cdot (x-2)(x-7)} = \frac{(x+1) \cdot (x-4)}{(x+5) \cdot (x-7)} = \frac{x^2-3x-4}{x^2-2x-35}.$$

$$10. \frac{4x^2-9}{x^2-10x+25} \div \frac{2x-3}{x-5} = \frac{(2x-3)(2x+3)}{(x-5)^2} \cdot \frac{x-5}{2x-3} = \frac{2x+3}{x-5}.$$

$$11. \frac{x^2-3x-10}{x^2-3x-28} \div \frac{x^2-x-6}{x^2+x-12} = \frac{(x-5)(x+2)}{(x-7)(x+4)} \cdot \frac{x^2+x-12}{x^2-x-6} = \frac{(x-5)(x+2)}{(x-7)(x+4)} \cdot \frac{(x+4)(x-3)}{(x-3)(x+2)} = \frac{x-5}{x-7}.$$

$$12. \frac{x}{x+3} + \frac{4}{x-5} = \frac{x(x-5)}{(x+3)(x-5)} + \frac{4(x+3)}{(x-5)(x+3)} = \frac{x^2-x+12}{(x-5)(x+3)} = \frac{(x-4)(x+3)}{(x-5)(x+3)} = \frac{x-4}{x-5}.$$

$$13. \frac{x-4}{x+1} - \frac{x-2}{x-1} = \frac{(x-4)(x-1)}{(x+1)(x-1)} - \frac{(x-2)(x+1)}{(x-1)(x+1)} = \frac{x^2-5x+4 - (x^2-x-2)}{(x-1)(x+1)},$$

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

$$14. \frac{\frac{x^2 y}{x+y}}{xy} = \frac{x^2 y}{xy(x+y)} = \frac{x}{x+y}.$$

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

Solve:

$$16. \frac{5}{7} + \frac{9}{t+3} = 2$$

$$17. \frac{3}{x-1} + \frac{12}{5} = 3$$

$$18. \frac{7}{9} - \frac{x+8}{x+1} = -1$$

16.  $\frac{5}{7} + \frac{9}{t+3} = 2,$

$$\frac{9}{t+3} = 2 - \frac{5}{7},$$

$$\frac{9}{t+3} = \frac{14-5}{7},$$

$$\frac{9}{t+3} = \frac{9}{7},$$

$$t+3 = 7,$$

$$t = 4.$$

17.  $\frac{3}{x-1} + \frac{12}{5} = 3,$

$$\frac{3}{x-1} = 3 - \frac{12}{5},$$

$$\frac{3}{x-1} = \frac{15-12}{5},$$

$$\frac{3}{x-1} = \frac{3}{5},$$

$$x-1 = 5,$$

$$x = 6.$$

18.  $\frac{7}{9} - \frac{x+8}{x+1} = -1,$

$$\frac{7}{9} + 1 = \frac{x+8}{x+1},$$

$$\frac{18}{9} = \frac{x+8}{x+1},$$

$$2(x+1) = x+8,$$

$$2x+2 = x+8,$$

$$x = 6.$$