

Simplify each expression:

$$1. \frac{60x^2y^5}{48x^5y^3}$$

$$\frac{5y^2}{4x^3}$$

$$2. \frac{49a^4b^9}{56a^7b^{10}}$$

$$-\frac{7}{8a^3b}$$

$$3. \frac{8c^6(c-d)^2}{12c(c-d)^3}$$

$$\frac{2c^4}{3(c-d)}$$

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

Simplest Form

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

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

$$x+4$$

$$6. \frac{x^2-2x-15}{x^2+10x+21}$$

$$\frac{(x-5)(x+3)}{(x+7)(x+3)}$$

$$\frac{x-5}{x+7}$$

$$7. \frac{x^2-11x+10}{100-x^2}$$

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

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

$$8. \frac{x^3+27}{x^2-3x+9}$$

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

$$x+3$$

$$9. \frac{6x^2-5x-4}{10x^2+9x+2}$$

$$\frac{(3x-4)(2x+1)}{(5x+2)(2x+1)}$$

$$\frac{3x-4}{5x+2}$$

Multiply or Divide. Simplify your answer.

$$10. \frac{-ab^4 \cdot -c^7 d^3}{c^5 d^8 \cdot a^6 b^9}$$

$$\frac{ab^4 c^7 d^3}{a^6 b^9 c^5 d^8}$$

$$\frac{c^2}{a^5 b^5 d^5}$$

$$11. \left(\frac{x^3 y^4}{ab^2}\right) \cdot \left(\frac{a^8 b^2}{x^7 y^7}\right) \cdot \left(\frac{x^2 y^3 a^4}{b^5 y}\right)$$

$$\frac{x^5 y^7 a^{12} b^2}{x^7 y^8 a b^7}$$

$$\frac{a^{11}}{x^2 y b^5}$$

$$12. \frac{x+5}{x-3} \cdot \frac{x-3}{x-10}$$

$$\frac{x+5}{x-10}$$

$$13. \frac{x^2-x-2}{x^2+8x+15} \cdot \frac{x^2-x-12}{x^2-9x+14}$$

$$\frac{(x-2)(x+1)}{(x+5)(x+3)} \cdot \frac{(x-4)(x+3)}{(x-7)(x-2)}$$

$$\frac{(x+1)(x-4)}{(x+5)(x-7)}$$

$$14. \frac{2x^2+9x+10}{x^2+5x+6} \cdot \frac{x^2+7x+12}{2x^2+3x-5}$$

$$\frac{(2x+5)(x+2)}{(x+3)(x+2)} \cdot \frac{(x+4)(x+3)}{(2x+5)(x-1)}$$

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

$$15. \frac{a^3 c^7}{b^4} \div \frac{b^5 c^9}{a^2}$$

$$\frac{a^3 c^7}{b^4} \cdot \frac{a^2}{b^5 c^9}$$

$$\frac{a^5 c^7}{b^9 c^9} = \frac{a^5}{b^9 c^2}$$

$$16. \frac{a^5 b^6}{c^2 d^5} \div a^5 d^2$$

$$\frac{a^5 b^6}{c^2 d^5} \cdot \frac{1}{a^5 d^2}$$

$$\frac{a^5 b^6}{a^5 c^2 d^7}$$

$$\frac{b^6}{c^2 d^7}$$

$$17. \frac{7x+7}{21x} \div \frac{x^2-1}{3x}$$

$$\frac{7(x+1)}{3 \cdot 7x} \cdot \frac{3x}{(x+1)(x-1)}$$

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

$$18. \frac{x^2-3x-10}{x^2-3x-28} \div \frac{x^2-x-6}{x^2+x-12}$$

$$\frac{(x-5)(x+2)}{(x-7)(x+4)} \cdot \frac{(x+4)(x-3)}{(x-3)(x+2)}$$

$$\frac{(x-5)}{(x-7)}$$

$$19. \frac{6x^2+x-1}{6x^2+5x+1} \div \frac{3x^2+2x-1}{3x^2+4x+1}$$

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

$$1$$

Add or Subtract. Simplify your answer.

$$20. \frac{x+8}{x+5} + \frac{x+7}{x+5}$$

$$\frac{2x+15}{x+5}$$

$$21. \frac{x-3}{x-1} - \frac{4x-6}{x-1}$$

$$\frac{-3x+3}{x-1}$$

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

$$-3$$

$$22. \frac{3x+2}{5x-20} - \frac{2x+6}{5x-20}$$

$$\frac{x-4}{5(x-4)} = \frac{1}{5}$$

$$23. \frac{3}{x} + \frac{8}{x+1}$$

$$\frac{3(x+1)}{x(x+1)} + \frac{8x}{x(x+1)}$$

$$\frac{3x+3}{x(x+1)} + \frac{8x}{x(x+1)}$$

$$\frac{11x+3}{x(x+1)}$$

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

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

$$\frac{x^2+x-12+2x+2}{(x+1)(x-3)}$$

$$\frac{x^2+3x-10}{(x+1)(x-3)}$$

$$25. \frac{(x)(x)(x^2-1)}{x^2+2x-8} - \frac{2(x-4)(x+2)}{x^2-2x} + \frac{5(x+1)(x-1)(x+2)}{x^2+4x}$$

LCD = x(x+4)(x-2)(x+1)(x-1)

$$\frac{x^4 - x^2 - (2x^2 + 4x - 16) + 5x^3 + 10x^2 - 5x - 10}{x(x+4)(x-2)(x+1)(x-1)}$$

$$\frac{x^4 + 5x^3 + 9x^2 - 9x + 6}{x(x+4)(x-2)(x+1)(x-1)}$$

$$26. \frac{x(x+4)}{x^2+10x+24} + \frac{4(x+6)}{x^2+12x+32} - \frac{2(x+4)}{x^2+14x+48}$$

LCD = (x+6)(x+4)(x+8)

$$\frac{x^2+8x+4x+24 + 2x+8}{(x+6)(x+4)(x+8)}$$

$$x^2+10x+16$$

$$\frac{\cancel{x^2+10x+16} + 32}{(x+6)(x+4)(x+8)}$$

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

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

$$27. \frac{x(x+1)}{x^2-7x+12} - \frac{2(x+4)}{x^2-4x+3} + \frac{3(x-3)}{x^2-5x+4}$$

LCD = (x-4)(x-3)(x-1)

$$\frac{x^2-x - (2x-8) + 3x-9}{(x-4)(x-3)(x-1)}$$

$$x^2-1$$

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

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

LCD = (x+6)(x+4)(x+8)

LCD = (x-4)(x-3)(x-1)

Simplify:

$$28. \frac{\frac{9x^5}{x^2-6x-16}}{\frac{18x^3}{x^2-11x+24}}$$

$$\frac{9x^5}{(x-8)(x+2)} \cdot \frac{(x-8)(x-3)}{18x^3}$$

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

$$29. \frac{\left(\frac{6x}{x^2+x-2}\right)(x+2)(x-1)}{\left(\frac{4}{x+2}\right)\left(\frac{1}{x-1}\right)(x+2)(x-1)}$$

$$\frac{16}{4(x-1) - (x+2)}$$

$$\frac{16}{4x-4-x-2}$$

$$\frac{16}{3x-6}$$

$$30. \frac{\left(\frac{2}{x+1}\right)\left(\frac{5}{x-2}\right)x(x+1)(x-2)}{\left(\frac{3}{x-2}\right)\left(\frac{2}{x}\right)(x)(x+1)(x-2)}$$

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

$$\frac{2x^2 - 4x - 5x^2 - 5x}{3x^2 + 3x + 2x^2 - 4x - 4}$$

$$\frac{-3x^2 - 9x}{5x^2 - x - 4}$$

$$31. \frac{x+9+\frac{14}{x}}{x+6-\frac{7}{x}}$$

$$\frac{x(x+9) + 14}{x(x+6) - 7}$$

$$\frac{x^2 + 9x + 14}{x^2 - 6x - 7}$$

$$\frac{(x+2)(x+7)}{(x-7)(x+1)}$$

Solve each equation:

$x \neq 5$ LCD = $3(x-5)$

$$32. \left(\frac{4}{x-5}\right) \left(\frac{1}{3}\right) = \left(\frac{-8}{3x-15}\right)$$

$$4 \cdot 3 - (x-5) = -8$$

$$12 - x + 5 = -8$$

$$-x + 17 = -8$$

$$-x = -25$$

$$x = 25$$

$$x = 4, 5$$

$$33. \frac{7}{x-4} + \frac{2}{x-5} = \frac{10}{x^2 - 9x + 20}$$

$$7(x-5) + 2(x-4) = 10$$

$$7x - 35 + 2x - 8 = 10$$

$$9x - 43 = 10$$

$$9x = 53$$

$$x = \frac{53}{9}$$

$x \neq -5, 3$

$$34. \frac{3}{x+5} + \frac{1}{x-3} = \frac{7}{x^2 + 2x - 15}$$

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

$$3x - 9 + x + 5 = 7$$

$$4x - 4 = 7$$

$$4x = 11$$

$$x = \frac{11}{4}$$

$x \neq 0$ LCD = x^2

$$35. \frac{4}{x^2} + \frac{11}{x} = 3$$

$$4 + 11x = 3x^2$$

$$3x^2 - 11x - 4 = 0$$

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

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

$x \neq \pm 2$ LCD = $(x+2)(x-2)$

$$36. \frac{3}{x+2} - \frac{4}{x-2} = \frac{8}{x^2 - 4}$$

$$3(x-2) - 4(x+2) = 8$$

$$3x - 6 - 4x - 8 = 8$$

~~$$-x - 14 = 8$$~~

$$-x - 14 = 8$$

$$-x = 22$$

$$x = -22$$

$x \neq -5$

LCD = $6(x+5)$

$$37. \frac{x}{x+5} - \frac{2}{3} = \frac{x}{2x+10}$$

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

$$6x - 4x - 20 = 3x$$

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

$$-20 = 5x$$

$$x = -4$$

