

6.3

Exercise Set

FOR EXTRA HELP



Concept Reinforcement Each of Exercises 1–4 shows a complex rational expression and the first step taken to simplify that expression. Indicate for each which method is being used: (a) multiplying by the LCD (method 1), or (b) using division to simplify (method 2).

$$1. \text{ (a) } \frac{\frac{1}{x} + \frac{1}{2}}{\frac{1}{3} - \frac{1}{x}} \Rightarrow \frac{\frac{1}{x} + \frac{1}{2}}{\frac{1}{3} - \frac{1}{x}} \cdot \frac{6x}{6x}$$

$$2. \text{ (b) } \frac{\frac{1}{x} + \frac{1}{2}}{\frac{1}{3} - \frac{1}{x}} \Rightarrow \frac{\frac{1}{x} \cdot \frac{2}{2} + \frac{1}{2} \cdot \frac{x}{x}}{\frac{1}{3} \cdot \frac{x}{x} - \frac{1}{x} \cdot \frac{3}{3}}$$

$$3. \text{ (b) } \frac{\frac{x-1}{x}}{x^2-1} \Rightarrow \frac{x-1}{x} \div \frac{x^2}{x^2-1}$$

$$4. \text{ (a) } \frac{\frac{x-1}{x}}{x^2-1} \Rightarrow \frac{\frac{x-1}{x}}{\frac{x^2}{x^2-1}} \cdot \frac{x(x+1)(x-1)}{x(x+1)(x-1)}$$

Simplify. If possible, use a second method, evaluation, or a graphing calculator as a check.

$$5. \frac{\frac{1}{2} + \frac{1}{3}}{\frac{1}{4} - \frac{1}{6}} \quad 10$$

$$6. \frac{\frac{2}{5} - \frac{1}{10}}{\frac{7}{20} - \frac{4}{15}} \quad \frac{18}{5}$$

$$7. \frac{1 + \frac{1}{4}}{2 + \frac{3}{4}} \quad \frac{5}{11}$$

$$8. \frac{3 + \frac{1}{4}}{1 + \frac{1}{2}} \quad \frac{13}{6}$$

$$9. \frac{\frac{x}{4} + x}{\frac{4}{x} + x} \quad \frac{5x^2}{4(x^2 + 4)}$$

$$10. \frac{\frac{1}{c} + 2}{\frac{1}{c} - 5} \quad \frac{2c + 1}{1 - 5c}$$

$$11. \frac{\frac{x+2}{x-1}}{\frac{x+4}{x-3}} \quad \frac{(x+2)(x-3)}{(x-1)(x+4)}$$

$$12. \frac{\frac{x-1}{x+3}}{\frac{x-6}{x+2}} \quad \frac{(x-1)(x+2)}{(x+3)(x-6)}$$

$$13. \frac{\frac{5}{a} - \frac{4}{b}}{\frac{2}{a} + \frac{3}{b}} \quad \frac{5b - 4a}{2b + 3a}$$

$$14. \frac{\frac{2}{4} - \frac{3}{5}}{\frac{r}{4} + \frac{t}{5}} \quad \frac{2t - 3r}{4t + 5r}$$

$$15. \frac{\frac{3}{z^2} + \frac{2}{yz}}{\frac{4}{zy^2} - \frac{1}{y}} \quad \frac{y(3y + 2z)}{z(4 - yz)}$$

$$16. \frac{\frac{6}{x^3} + \frac{7}{y}}{\frac{7}{xy^2} - \frac{6}{x^2y^2}} \quad \frac{y(6y + 7x^3)}{x(7x - 6)}$$

$$17. \frac{\frac{a^2 - b^2}{ab}}{\frac{a - b}{b}} \quad \frac{a + b}{a}$$

$$18. \frac{\frac{xy}{x - y}}{y} \quad \frac{x + y}{x}$$

$$19. \frac{1 - \frac{2}{3x}}{x - \frac{4}{9x}} \quad \frac{3}{3x + 2}$$

$$20. \frac{\frac{3x}{y} - x}{2y - \frac{y}{x}} \quad \frac{x^2(3 - y)}{y^2(2x - 1)}$$

$$21. \frac{\frac{y^{-1} - x^{-1}}{x^2 - y^2}}{xy} \quad \frac{1}{x + y}$$

$$22. \frac{\frac{a^{-1} + b^{-1}}{a^2 - b^2}}{ab} \quad \frac{1}{a - b}$$

$$23. \frac{\frac{1}{a-h} - \frac{1}{a}}{h} \quad \frac{1}{a(a-h)}$$

$$24. \frac{\frac{1}{x+h} - \frac{1}{x}}{h} \quad \frac{1}{x(x+h)}$$

$$25. \frac{\frac{a^2 - 4}{a^2 + 3a + 2}}{\frac{a^2 - 5a - 6}{a^2 - 6a - 7}} \quad \frac{(a-2)(a-7)}{(a+1)(a-6)}$$

$$26. \frac{\frac{x^2 - x - 12}{x^2 - 2x - 15}}{\frac{x^2 + 8x + 12}{x^2 - 5x - 14}} \quad \frac{(x-4)(x-7)}{(x-5)(x+6)}$$

$$27. \frac{\frac{x}{x^2 + 3x - 4} - \frac{1}{x^2 + 3x - 4}}{\frac{x}{x^2 + 6x + 8} + \frac{1}{x^2 + 6x + 8}} \quad \frac{x + 2}{x + 3}$$

$$28. \frac{\frac{x}{x^2 + 5x - 6} + \frac{6}{x^2 + 5x - 6}}{\frac{x}{x^2 - 5x + 4} - \frac{2}{x^2 - 5x + 4}} \quad \frac{x - 4}{x - 2}$$

$$29. \frac{\frac{y + y^{-1}}{y - y^{-1}}}{\frac{y^2 + 1}{y^2 - 1}}$$

$$30. \frac{\frac{x - x^{-1}}{x + x^{-1}}}{x^2 + 1} \quad \frac{x^2 - 1}{x^2 + 1}$$

$$31. \frac{\frac{1}{y} + 2}{\frac{1}{y} - 3} \cdot \frac{1 + 2y}{1 - 3y}$$

$$32. \frac{7 + \frac{1}{a}}{\frac{1}{a} - 3} \cdot \frac{7a + 1}{1 - 3a}$$

$$53. \frac{\frac{y^2}{y^2 - 25} - \frac{y}{y - 5}}{\frac{y}{y^2 - 25} - \frac{1}{y + 5}} - y$$

$$54. \frac{\frac{y^2}{y^2 - 9} - \frac{y}{y + 3}}{\frac{y}{y^2 - 9} - \frac{1}{y - 3}}$$

$$33. \frac{y + y^{-2}}{y - y^{-2}} \cdot \frac{(y + 1)(y^2 - y + 1)}{(y - 1)(y^2 + y + 1)}$$

$$34. \frac{x - x^{-2}}{x + x^{-2}} \cdot \frac{(x - 1)(x^2 + x + 1)}{(x + 1)(x^2 - x + 1)}$$

$$55. \frac{\frac{a}{a + 2} + \frac{5}{a}}{\frac{a}{2a + 4} + \frac{1}{3a}}$$

$$56. \frac{\frac{-y}{a + 3} + \frac{4}{5a}}{\frac{a}{2a + 6} + \frac{3}{a}}$$

$$35. \frac{\frac{x^2}{x^2 - y^2}}{\frac{x}{x + y}} \cdot \frac{x}{x - y}$$

$$36. \frac{\frac{a^2}{3a}}{\frac{a - 2}{a^2 - 4}} \cdot \frac{a(a + 2)}{3}$$

$$\frac{6(a^2 + 5a + 10)}{3a^2 + 2a + 4} \cdot \frac{2(5a^2 + 4a + 12)}{5(a^2 + 6a + 18)}$$

$$57. \frac{\frac{1}{x^2 - 3x + 2} + \frac{1}{x^2 - 4}}{\frac{1}{x^2 + 4x + 4} + \frac{1}{x^2 - 4}}$$

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

Aha! $37. \frac{\frac{x}{5y^3} + \frac{3}{10y}}{\frac{3}{10y} + \frac{x}{5y^3}} = 1$

$$38. \frac{\frac{a}{6b^3} + \frac{4}{9b^2}}{\frac{5}{6b} - \frac{1}{9b^3}} \cdot \frac{3a + 8b}{15b^2 - 2}$$

$$58. \frac{\frac{1}{x^2 + 3x + 2} + \frac{1}{x^2 - 1}}{\frac{1}{x^2 - 1} + \frac{1}{x^2 - 4x + 3}} \cdot \frac{(2x + 1)(x - 3)}{2(x + 2)(x - 1)}$$

$$39. \frac{\frac{3}{ab^4} + \frac{4}{a^3b}}{ab} \cdot \frac{3a^2 + 4b^3}{a^4b^5}$$

$$40. \frac{\frac{2}{x^2y} + \frac{3}{xy^2}}{xy} \cdot \frac{2y + 3x}{x^3y^3}$$

$$59. \frac{\frac{3}{a^2 - 4a + 3} + \frac{3}{a^2 - 5a + 6}}{\frac{3}{a^2 - 3a + 2} + \frac{3}{a^2 + 3a - 10}} \cdot \frac{(2a - 3)(a + 5)}{2(a - 3)(a + 2)}$$

$$41. \frac{\frac{x - y}{\frac{1}{x^3} - \frac{1}{y^3}}}{\frac{-x^3y^3}{y^2 + xy + x^2}}$$

$$42. \frac{\frac{1}{a} + \frac{1}{b}}{\frac{1}{a^3} + \frac{1}{b^3}} \cdot \frac{a^2b^2}{b^2 - ab + a^2}$$

$$43. \frac{\frac{1}{x - 2} + \frac{3}{x - 1}}{\frac{2}{x - 1} + \frac{5}{x - 2}} \cdot \frac{4x - 7}{7x - 9}$$

$$44. \frac{\frac{2}{y - 3} + \frac{1}{y + 1}}{\frac{3}{y + 1} + \frac{4}{y - 3}} \cdot \frac{3y - 1}{7y - 5}$$

$$60. \frac{\frac{1}{a^2 + 7a + 10} - \frac{2}{a^2 - 7a + 12}}{\frac{2}{a^2 - a - 6} - \frac{1}{a^2 + a - 20}} \cdot \frac{-a^2 - 21a - 8}{a^2 + 3a - 34}$$

$$45. \frac{a(a + 3)^{-1} - 2(a - 1)^{-1}}{a(a + 3)^{-1} - (a - 1)^{-1}} \cdot \frac{a^2 - 3a - 6}{(a - 3)(a + 1)}$$

Aha! $61. \frac{\frac{y}{y^2 - 4} - \frac{2y}{y^2 + y - 6}}{\frac{2y}{y^2 + y - 6} - \frac{y}{y^2 - 4}} = -1$

$$46. \frac{a(a + 2)^{-1} - 3(a - 3)^{-1}}{a(a + 2)^{-1} - (a - 3)^{-1}} \cdot \frac{a^2 - 6a - 6}{a^2 - 4a - 2}$$

$$47. \frac{\frac{2}{a^2 - 1} + \frac{1}{a + 1}}{\frac{3}{a^2 - 1} + \frac{2}{a - 1}} \cdot \frac{a + 1}{2a + 5}$$

$$48. \frac{\frac{3}{a^2 - 9} + \frac{2}{a + 3}}{\frac{4}{a^2 - 9} + \frac{1}{a + 3}} \cdot \frac{2a - 3}{a + 1}$$

$$62. \frac{\frac{y}{y^2 - 1} - \frac{3y}{y^2 + 5y + 4}}{\frac{3y}{y^2 - 1} - \frac{y}{y^2 - 4y + 3}} \cdot \frac{-(y - 3)(2y - 7)}{2(y - 5)(y + 4)}$$

$$49. \frac{\frac{5}{x^2 - 4} - \frac{3}{x - 2}}{\frac{x^2 - 4}{4} - \frac{2}{x + 2}} \quad \square$$

$$50. \frac{\frac{4}{x^2 - 1} - \frac{3}{x + 1}}{\frac{5}{x^2 - 1} - \frac{2}{x - 1}} \quad \square$$

$$63. \frac{t + 5 + \frac{3}{t}}{t + 2 + \frac{1}{t}} \quad \square$$

$$64. \frac{a + 3 + \frac{2}{a}}{a + 2 + \frac{5}{a}} \quad \square$$

$$51. \frac{\frac{y^3}{y^2 - 4} + \frac{125}{4 - y^2}}{\frac{y}{y^2 - 4} + \frac{5}{4 - y^2}} \quad \square$$

$$52. \frac{\frac{y}{y^2 - 1} - \frac{3}{1 - y^2}}{\frac{y^3}{y^2 - 1} - \frac{27}{1 - y^2}} \quad \square$$

$$65. \frac{x - 2 - \frac{1}{x}}{x - 5 - \frac{4}{x}} \quad \square$$

$$66. \frac{x - 3 - \frac{2}{x}}{x - 4 - \frac{3}{x}} \quad \square$$