Rational and Radical Functions

Review 8.1 / Rational Functions, Part 1

8.1.1 Variation Functions

Given: y varies directly as x. Write and graph each direct variation function.

1. $y = 4$ when $x = 8$

2. $y = 12$ when $x = 2$

3. $y = -15$ when $x = 5$

4. **Medicine** The dosage d of a drug that a physician prescribes varies directly as the patient's mass m, and $d = 100$ mg when $m = 55$ kg. Find d to the nearest milligram when $m = 70$ kg.

5. **Nutrition** The number of Calories C in a horned melon varies directly as its weight w, and $C = 25$ Cal when $w = 3.5$ oz. How many Calories are in the horned melon shown on the scale? Round to the nearest Calorie.

12.35 oz

6. **Agriculture** The number of bags of soybean seeds N that a farmer needs varies jointly as the number of acres a to be planted and the pounds of seed needed per acre p, and $N = 980$ when $a = 700$ acres and $p = 70$ lb/acre. Find N when $a = 1000$ acres and $p = 75$ lb/acre.

7. **Physics** The heat Q required to raise the temperature of water varies jointly as the mass m of the water and the amount of temperature change T, and $Q = 20{,}930$ joules (J) when $m = 1$ kg and $T = 5°C$. Find m when $Q = 8372$ J and $T = 10°C$.

Given: y varies inversely as x. Write and graph the inverse variation function.

8. $y = 1$ when $x = 0.8$

9. $y = 1.75$ when $x = 6$

10. $y = -2$ when $x = 3$

11. **Entertainment** The number of days it takes a movie crew to set up a stage for a scene varies inversely as the number of workers. If the stage can be set up in 3 days by 20 workers, how many days would it take if only 12 workers were available?

8.1.2 Multiplying and Dividing Rational Expressions

Simplify. Identify any x-values for which the expression is undefined.

12. $\dfrac{4x - 8}{x^2 - 2x}$

13. $\dfrac{8x - 4}{2x^2 + 9x - 5}$

14. $\dfrac{x^2 - 36}{x^2 - 12x + 36}$

15. $\dfrac{3x + 18}{24 - 2x - x^2}$

16. $\dfrac{-2x^2 - 9x}{4x^2 - 81}$

17. $\dfrac{4x + 20}{-5 - x}$

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Multiply. Assume that all expressions are defined.

18. $\dfrac{x^2y}{4xy} \cdot \dfrac{x}{6} \cdot \dfrac{3y^5}{x^4}$

19. $\dfrac{x-4}{x-3} \cdot \dfrac{2x-1}{x+4}$

20. $\dfrac{x^2-2x-8}{9x^2-16} \cdot \dfrac{3x^2+10x+8}{x^2-16}$

21. $\dfrac{4x^2-20x+25}{x^2-4x} \cdot \dfrac{3x-12}{2x-5}$

Divide. Assume that all expressions are defined.

22. $\dfrac{4x^2+15x+9}{8x^2+10x+3} \div \dfrac{x^2+4x}{2x+1}$

23. $\dfrac{x^2-4x-5}{x^2-3x+2} \div \dfrac{x^2-3x-10}{x^2-4}$

24. $\dfrac{x+2}{x-4} \div \dfrac{1}{3x-12}$

25. $\dfrac{x^2-2x-3}{x^2-x-2} \div \dfrac{x^2+2x-15}{x^2+x-6}$

Solve. Check your solution.

26. $\dfrac{3x^2+10x+8}{-x-2} = -2$

27. $\dfrac{x^2-9}{x-3} = 5$

28. $\dfrac{x^2+3x-28}{(x+7)(x-4)} = -11$

8.1.3 Adding and Subtracting Rational Expressions

Add or subtract. Identify any x-values for which the expression is undefined.

29. $\dfrac{2x-3}{4x-7} + \dfrac{2x-3}{4x-7}$

30. $\dfrac{x-5}{3x+4} - \dfrac{3x-5}{3x+4}$

31. $\dfrac{x^2-3}{2x+7} - \dfrac{2x-5}{2x+7}$

Find the least common multiple for each pair.

32. $12x^2y^3$ and $14x^3y^2$

33. $16x^2 - 25$ and $4x^2 - x - 5$

Add or subtract. Identify any x-values for which the expression is undefined.

34. $\dfrac{3x-2}{x+2} + \dfrac{2x}{4x-1}$

35. $\dfrac{2x-7}{x-2} + \dfrac{8x}{3x-6}$
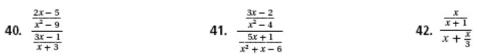
36. $\dfrac{5x}{4x^2} + \dfrac{7}{x+1}$

37. $\dfrac{4x-3}{x^2-9} - \dfrac{2x-3}{x-3}$

38. $\dfrac{x}{2x+3} - \dfrac{2x+1}{2x-3}$

39. $\dfrac{1}{x-4} - \dfrac{2}{x^2-6x+8}$

Simplify. Assume that all expressions are defined.

40. $\dfrac{\frac{2x-5}{x^2-9}}{\frac{3x-1}{x+3}}$

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

42. $\dfrac{\frac{x}{x+1}}{x+\frac{x}{3}}$

43. **Chemistry** A solution is heated from 0°C to 100°C. Between 0°C and 50°C, the rate of temperature increase is 1.5°C/min. Between 50°C and 100°C, the rate of temperature increase is 0.4°C/min. What is the average rate of temperature increase during the entire heating process? Round to the nearest tenth.