

Rational Functions and Equations

Rational Functions and Expressions

12.1.1 Inverse Variation

Tell whether each relationship is an inverse variation. Explain.

1.

x	y
3	-3
-5	5
7	-7

2.

x	y
2	5
0.5	20
8	1.25

3. $x = \frac{13}{y}$

4. $y = 5x$

5. Write and graph the inverse variation in which $y = -2$ when $x = 5$.6. Write and graph the inverse variation in which $y = -6$ when $x = -\frac{1}{3}$.7. **Engineering** The inverse variation $xy = 12$ relates the current x in amps to the resistance y in ohms of a circuit attached to a 12-volt battery. Determine a reasonable domain and range and then graph this inverse variation. Use the graph to estimate the resistance of a circuit when the current is 5 amps.

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8. Let $x_1 = -3$, $y_1 = -4$, and $y_2 = 6$. Let y vary inversely as x . Find x_2 .
9. Let $x_1 = 7$, $y_1 = 9$, and $x_2 = 6$. Let y vary inversely as x . Find y_2 .
10. **Home Economics** The length of fabric that June can afford varies inversely as the price per yard of the fabric. June can afford exactly 5 yards of fabric that costs \$10.50 per yard. How many yards of fabric that costs \$4.25 per yard can June buy? (Assume that she can only buy whole yards.)

12.1.2 Rational Functions

Identify the excluded value for each rational function.

11. $y = \frac{7}{x}$

12. $y = \frac{1}{x-4}$

13. $y = -\frac{15}{x}$

14. $y = \frac{12}{x-5}$

Identify the asymptotes.

15. $y = \frac{9}{x-4}$

16. $y = \frac{2}{x+4}$

17. $y = \frac{7}{4x-12} + 4$

18. $y = \frac{7}{3x+5} - 9$

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Graph each function.

19. $y = \frac{5}{x-5}$

20. $y = \frac{1}{x+5} - 6$

21. $y = \frac{1}{x+4}$

22. $y = \frac{1}{x-4} + 2$

23. **Business** A wholesaler is buying auto parts. He has \$200 to spend. He receives 5 parts free with the order. The number of parts y he can buy, if the average price of the parts is x dollars, is $y = \frac{200}{x} + 5$.

a. Describe the reasonable domain and range values.

b. Graph the function.

12.1.3 Simplifying Rational Expressions

Find any excluded values of each rational expression.

24. $\frac{c}{c^2 + c}$

25. $\frac{2}{-3x}$

26. $\frac{4}{x^2 - 3x - 10}$

27. $\frac{n^2 - 1}{2n^2 - 7n - 4}$

Simplify each rational expression, if possible. Identify any excluded values.

28. $\frac{4d^3 + 4d^2}{d + 1}$

29. $\frac{3m^2}{m - 4}$

30. $\frac{10y^4}{2y}$

31. $\frac{2t^2}{16t}$

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Simplify each rational expression, if possible.

32. $\frac{q-6}{q^2-9q+18}$

33. $\frac{z^2-2z+1}{z^2-1}$

34. $\frac{t-3}{t^2-5t+6}$

35. $\frac{p^2-6p-7}{p^2-4p-5}$

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

37. $\frac{2x-4}{x^2-6x+8}$

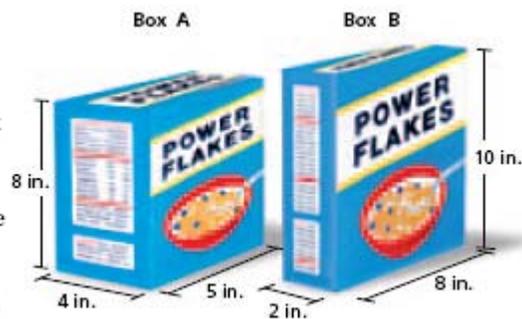
38. $\frac{20-4x}{x^2-25}$

39. $\frac{3-3b}{3b^2+18b-21}$

40. $\frac{3v-36}{144-v^2}$

41. **Geometry** When choosing package sizes, a company wants a package that uses the least amount of material to hold the greatest volume of product.

- a. What is the surface-area-to-volume ratio for a rectangular prism?
(Hint: For a rectangular prism, $S = 2lw + 2lh + 2wh$ and $V = lwh$.)



- b. Which box should the company choose? Explain.