

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

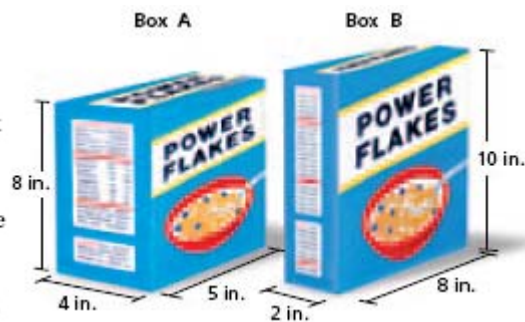
38.  $\frac{20-4x}{x^2-25}$

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.