

KEY

Chapter 5 Review

NON-CALCULATOR

On a separate piece of paper, thoroughly explain each of the following terms within the context of this chapter:

Combined variation  
 Constant of variation  
 Cube root function  
 Direct variation  
 Extraneous solution  
 Hyperbola

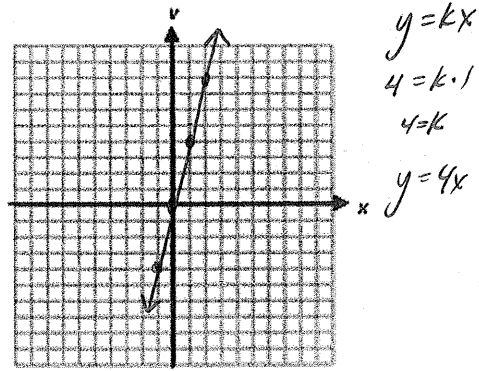
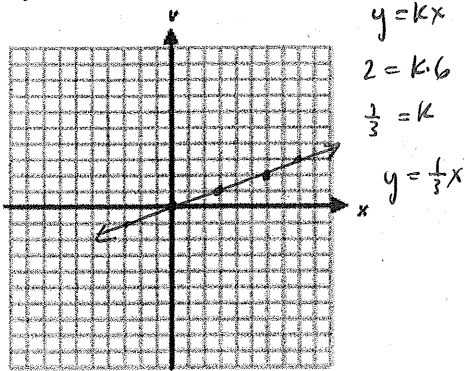
Inverse variation  
 Joint variation  
 Radical equation  
 Radical function  
 Radical inequality  
 Rational equation

Rational exponent  
 Rational function  
 Rational inequality  
 Square root function

Given that y varies directly as x, write and graph each direct variation function.

1.  $y = 2$  when  $x = 6$

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



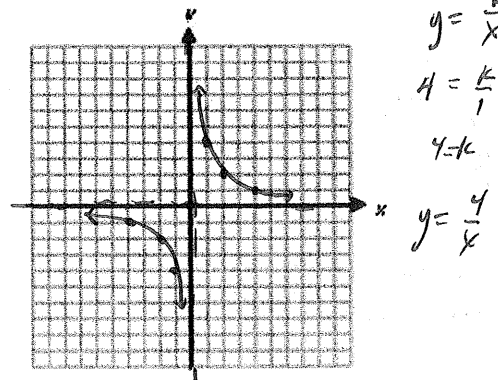
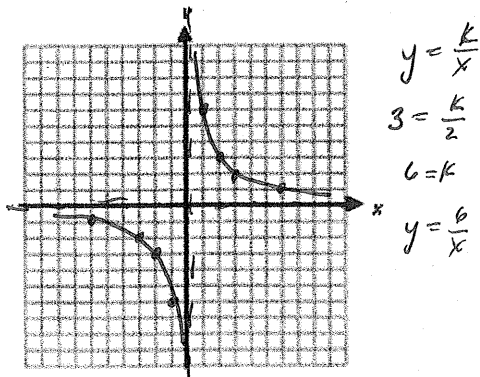
Equation:  $y = \frac{1}{3}x$

Equation:  $y = 4x$

Given that y varies inversely as x, write and graph each inverse variation function.

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

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



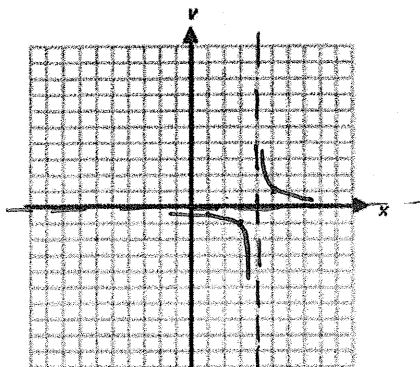
Equation:  $y = \frac{6}{x}$

Equation:  $y = \frac{4}{x}$

$(1,1)$   $\boxed{\text{HA}}$   $y=0$   
 $(-1,-1)$   $\boxed{\text{VA}}$   $x=0$

Using the graph of  $f(x) = \frac{1}{x}$  as a guide, describe the transformation and graph each function. Then, identify the asymptotes, domain and range of each function.

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



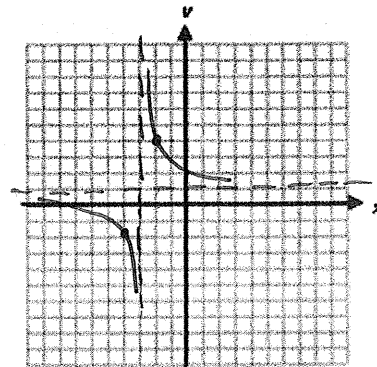
Description: Right 4  
 $(x+4, y)$

Asymptotes:  $x=4$   $\boxed{\text{VA}}$  |  $y=0$   $\boxed{\text{HA}}$

Domain:  $x \neq 4$

Range:  $y \neq 0$

6.  $f(x) = \frac{3}{x+3} + 1$



$(1,1) \rightarrow (-2, 4)$   
 $(-1,-1) \rightarrow (-4, -2)$

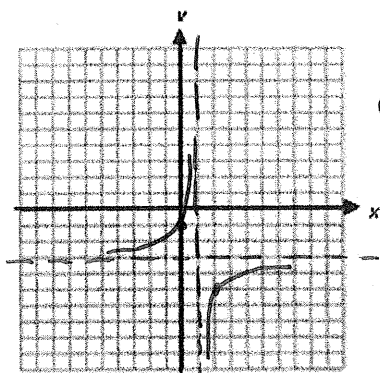
Description: vertical stretch by a factor of 3  
 Left 3, up 1  
 $(x-3, 3y+1)$

Asymptotes:  $x=-3$   $\boxed{\text{VA}}$  |  $y=1$   $\boxed{\text{HA}}$

Domain:  $x \neq -3$

Range:  $y \neq 1$

7.  $f(x) = \frac{-2}{x-1} - 3$



$(1,1) \rightarrow (2, -5)$   
 $(-1,-1) \rightarrow (0, -1)$

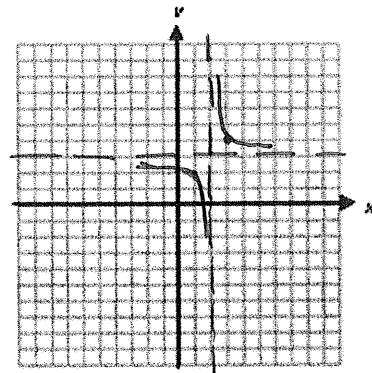
Description: vertical stretch by a factor of 2  
 Flipped over x-axis, Right 1, Down 3  
 $(x+1, -2y-3)$

Asymptotes:  $x=1$   $\boxed{\text{VA}}$  |  $y=-3$   $\boxed{\text{HA}}$

Domain:  $x \neq 1$

Range:  $y \neq -3$

8.  $f(x) = \frac{1}{x-2} + 3$



Description: Right 2, Up 3  
 $(x+2, y+3)$

Asymptotes:  $x=2$   $\boxed{\text{VA}}$  |  $y=3$   $\boxed{\text{HA}}$

Domain:  $x \neq 2$

Range:  $y \neq 3$

Divide each rational function in order to rewrite it in transformation form. Then, describe the transformation.

$$9. f(x) = \frac{4x-5}{x-1} \quad x-1 \overline{) \begin{array}{r} 4x-5 \\ -(4x-4) \\ \hline -1 \end{array}}$$

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

Transformed Form:  $f(x) = \frac{-1}{x-1} + 4$

Description: Flip over x-axis, Right 1, up 4  
 $(x+1, -y+4)$

Solve each equation.

$$11. \left( \frac{3x}{x+2} = \frac{2x+2}{x+2} \right) (x+2)$$

$$3x = 2x + 2$$

$$\boxed{x = 2}$$

$$13. \left( x - \frac{6}{x} = 1 \right) x$$

$$x^2 - 6 = x$$

$$\boxed{x = 3 \text{ or } x = -2}$$

$$x^2 - x - 6 = 0$$

$$(x-3)(x+2) = 0$$

$$10. g(x) = \frac{2x+10}{x+4} \quad x+4 \overline{) \begin{array}{r} 2x+10 \\ -(2x+8) \\ \hline 2 \end{array}}$$

$$= 2 + \frac{2}{x+4}$$

Transformed Form:  $f(x) = \frac{2}{x+4} + 2$

Description: Vertical stretch by a factor of 2  
 Left 4, up 2  
 $(x-4, 2y+2)$

$$12. \left( \frac{4x}{x-5} = \frac{3x+5}{x-5} \right) (x-5)$$

$$4x = 3x + 5$$

~~x = 5~~ extraneous!

$$14. \left( \frac{x}{x+4} + \frac{x}{2} = \frac{2x}{x+4} \right) (x+4)(2)$$

$$2x + x(x+4) = 2x(2)$$

$$2x + x^2 + 4x = 4x$$

$$x^2 + 2x = 0$$

$$x(x+2) = 0$$

$$x = 0 \text{ or } x = -2$$

Simplify each expression. Assume that all variables are positive.

$$15. \sqrt[3]{27x^6} = \boxed{3x^2}$$

$$16. \sqrt[4]{81x^{12}} = \boxed{3x^3}$$

$$17. \sqrt[3]{\frac{8x^3}{3}} = \boxed{\frac{2x}{\sqrt[3]{3}}}$$

Write each expression using radical exponents.

$$18. (\sqrt[3]{-27})^2 = \boxed{9}$$

$$(-3)^2 \rightarrow$$

$$19. \sqrt[4]{16^3} = (\sqrt[4]{16})^3 = (2)^3 = \boxed{8}$$

$$20. (\sqrt{9})^3 = (3)^3 = \boxed{27}$$

Simplify each expression.

$$21. 17^{\frac{1}{3}} \cdot 17^{\frac{2}{3}}$$

$$17^{\frac{3}{3}} = 17^1 = \boxed{17}$$

$$22. (9^4)^{\frac{1}{2}} = 9^2 = \boxed{81}$$

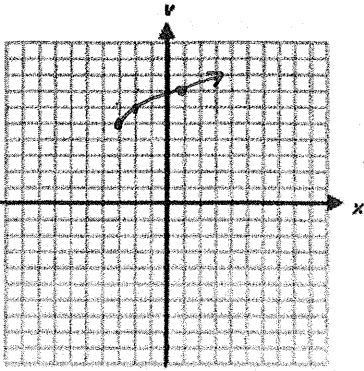
$$23. \left( \frac{1}{16} \right)^{\frac{1}{4}} = \boxed{\frac{1}{2}}$$

$$24. \left( \frac{8}{27} \right)^{\frac{1}{3}} = \boxed{\frac{2}{3}}$$

$$\begin{array}{c|c} \begin{matrix} (0,0) & (4,2) \\ (1,0) & \end{matrix} & \begin{matrix} (-1,-1) \\ (0,0) & (1,1) \end{matrix} \end{array}$$

Using the graph of  $f(x) = \sqrt{x}$  or  $f(x) = \sqrt[3]{x}$  as a guide, describe the transformation and graph each function. Then, identify the domain and range.

25.  $f(x) = \sqrt{x+3} + 5$

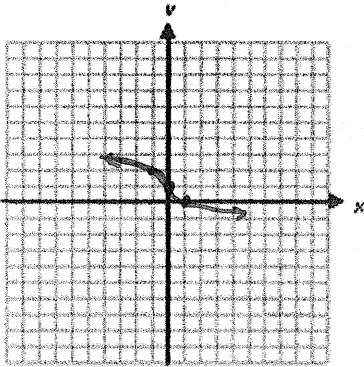


Description: Left 3 ups  
 $(x-3, y+5)$

Domain:  $x \geq -3$

Range:  $y \geq 5$

27.  $g(x) = -\sqrt[3]{x} + 1$



Description: Flip over x-axis, up 1  
 $(x, -y + 1)$

Domain:  $\mathbb{R}$

Range:  $\mathbb{R}$

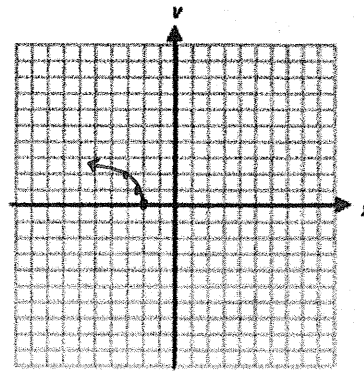
29. Write the transformed function. The parent function  $f(x) = \sqrt{x}$  is stretched vertically by a factor of 3 and translated 4 units left.

$$g(x) = 3\sqrt{x+4}$$

30. Write the transformed function. The parent function  $f(x) = \sqrt[3]{x}$  is reflected across the y-axis, is compressed horizontally by a factor of 2, and translated 1 unit up.

$$g(x) = \sqrt[3]{-\frac{1}{2}x} + 1$$

26.  $h(x) = \sqrt{-4(x+2)}$

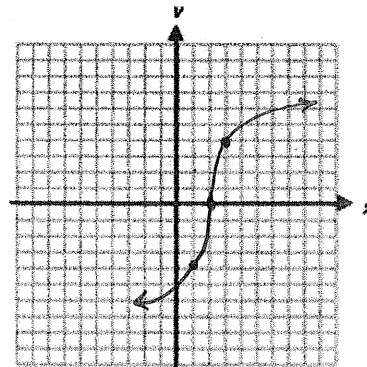


Description: Horizontal Compression by a factor of 1/4  
Flip over y-axis, Left 2  $(-1/4x - 2, y)$

Domain:  $x \geq -2$

Range:  $y \geq 0$

28.  $f(x) = 4\sqrt[3]{x-2}$



Description: Vertical stretch by a factor of 4  
Right 2  $(x+2, 4y)$

Domain:  $\mathbb{R}$

Range:  $\mathbb{R}$

Solve each equation.

31.  $\sqrt{x+6} - 7 = -2$   
 $\sqrt{x+6} = 5$   
 $x+6 = 25$   
 $x = 19$

32.  $\frac{\sqrt[3]{2x-2}}{6} = 1$   
 $\sqrt[3]{2x-2} = 6$   
 $2x-2 = 216$   
 $2x = 218$   
 $x = 109$

33.  $\sqrt{10x} = 3\sqrt{x+1}$   
 $10x = 9(x+1)$   
 $10x = 9x + 9$   
 $x = 9$

34.  $2\sqrt[3]{x} = \sqrt[3]{64}$   
 $32x = 64$   
 $x = 2$

35.  $\sqrt{x+1} = x-5$   
 $x+1 = x^2 - 10x + 25$   
 $0 = x^2 - 11x + 24$   
 $0 = (x-8)(x-3)$   
 $x = 8$  or  $x = 3$

36.  $(4x+7)^{1/2} = 3$   
 $4x+7 = 9$   
 $4x = 2$   
 $x = 1/2$

37.  $(x-4)^{1/4} = 3$   
 $x-4 = 81$   
 $x = 85$

38.  $x = (2x+35)^{1/2}$   
 $x^2 = 2x + 35$   
 $x^2 - 2x - 35 = 0$   
 $(x-7)(x+5) = 0$   
 $x = 7$  or  $x = -5$   
**CALCULATOR**

39.  $(x+3)^{1/3} = -6$   
 $x+3 = -216$   
 $x = -219$

40. The number of tiles needed  $n$  to cover a floor varies directly as the area  $a$  of the floor, and  $n = 180$  when  $a = 20 \text{ ft}^2$ . Write an equation for this situation. Then, find the number of tiles when  $a = 34 \text{ ft}^2$ .

$n = k \cdot a$   
 $180 = k \cdot 20$   
 $9 = k$   
 $n = 9a$

$n = 9(34)$   
 $n = 306$

41. For a fixed voltage, the current,  $I$  flowing in a wire varies inversely as the resistance  $R$  of the wire. If the current is 8 amperes when the resistance is 15 ohms, write an equation for this situation. Then, find the resistance when the current is 5 amperes.

$I = \frac{k}{R}$   
 $8 = \frac{k}{15} \Rightarrow k = 120$

$I = \frac{120}{R}$

$5 = \frac{120}{R}$   
 $R = \frac{120}{5} = 24$

42. Determine whether the data set represents direct variation, inverse variation, or neither.

x	2	5	10
y	25	10	5
x · y	50	50	50

$xy = 50$   
 $y = \frac{50}{x}$  varies inversely!

43. Given that  $y$  varies directly with  $x$  and inversely with  $z$ , complete the following table.

x	y	z
2.5	75	6
5	120	7.5
5	9	100
12	90	24

$y = \frac{kx}{z} \rightarrow 75 = \frac{k(2.5)}{6}$   
 $180 = k$

$y = \frac{180x}{z}$   
 $120 = \frac{180x}{7.5} \mid y = \frac{180(5)}{100} \mid 90 = \frac{180(z)}{z}$   
 $5 = x \mid y = 9 \mid z = 24$

44. The simple interest,  $I$  earned over a particular period of time varies jointly as the principal,  $P$ , and rate,  $r$ . If  $I = \$264$  when  $P = \$1100$  and  $r = 0.12$ , write an equation for this situation. Then, find  $P$  when  $I = \$360$  and  $r = 0.09$ .

$$I = k \cdot P \cdot r$$

$$264 = k(1100)(0.12)$$

$$20 = k$$

$$I = 20 \cdot P \cdot r$$

$$360 = 20 \cdot P \cdot (0.09)$$

$$\boxed{200 = P}$$

Solve each inequality.

45.  $\frac{x+4}{x} > -2$

$$\boxed{x < -1.333}$$

OR

$$\boxed{x > 0}$$

46.  $\frac{2}{x-3} < 4$

$$\boxed{x > 3.5}$$

OR

$$\boxed{x < 3}$$

47.  $\sqrt{x-4} \leq 3$

$$\boxed{4 \leq x \leq 13}$$

48.  $\sqrt{2x+7} - 6 > -1$

$$\boxed{x > 16}$$

49.  $\sqrt[3]{x-1} > -2$

$$\boxed{x > -7}$$

$(x-1)^{1/3}$

50. A tetrahedron is a triangular pyramid with four congruent faces. The side length  $s$  in meters of a tetrahedron is given by the formula  $s = (6V\sqrt{2})^{1/3}$ . Solve this equation for  $V$ .

$$s^3 = 6V\sqrt{2}$$

$$\boxed{\frac{s^3}{6\sqrt{2}} = V}$$

51. The time  $T$  in seconds required for a pendulum to complete one back-and-forth swing can be determined from the formula  $T = 2\pi\sqrt{\frac{L}{9.8}}$ , where  $L$  is the length of the pendulum in meters. Solve this equation for length of a pendulum in terms of time. Then, use the equation to estimate the length of a pendulum that completes one back-and-forth swing in 2.5 seconds.

$$\frac{T}{2\pi} = \sqrt{\frac{L}{9.8}}$$

$$\frac{T^2}{4\pi^2} = \frac{L}{9.8}$$

$$\boxed{\frac{9.8T^2}{4\pi^2} = L}$$

$$L = \frac{9.8(2.5)^2}{4\pi^2} \approx 1.551480625$$