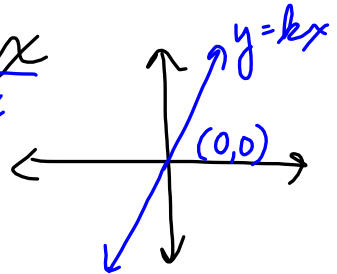


Sec. 8.1 Inverse Variation

Recall direct variation $y = kx$
 as one quantity increases, k x
 the other increases proportionally
 $k = \frac{y}{x}$



Inverse variation
 as one quantity increases,
 the other decreases proportionally

$$y = \frac{k}{x} \quad \text{OR} \quad xy = k \quad \text{OR} \quad x = \frac{k}{y}$$

Combined Variations

(joint variation one quantity varies directly with two or more quantities)

z varies jointly with x and y $z = kxy$

z varies jointly with x and y and inversely with w $z = \frac{kxy}{w}$

z varies directly with x and inversely with the product wy $z = \frac{kx}{wy}$

Problem 1: Is the relationship between the variables a direct variation, an inverse variation, or neither?

$$y = kx$$

$$k = \frac{y}{x}$$

$$y = \frac{k}{x}$$

$$k = xy$$

a.

x	y	$\frac{y}{x}$	xy
1	52	$\frac{52}{1} = 52$	$1 \cdot 52 = 52$
2	34	$\frac{34}{2} = 17$	$2 \cdot 34 = 68$
5	4	X	X
6	2	not direct variation	not inverse variation

neither

b.

x	y
0.2	0.80
0.4	0.40
0.5	0.32
1.0	0.16

Direct $k = \frac{y}{x}$

$$\frac{(0.80)}{0.2} \neq \frac{.4}{.4} \neq \frac{.32}{.5} \neq \frac{0.16}{1}$$

not D.V.

Inverse $y = \frac{k}{x} \rightarrow k = xy$

$$k = \boxed{0.16} = (.2)(.8) = (.4)(.4) = (0.5)(0.32) = 1(0.16)$$

Inverse $y = \frac{0.16}{x}$

Problem 2: Suppose x and y vary inversely,
and $x=2$ when $y=8$. $k=xy$ $y = \frac{k}{x}$

a. What is the function of the inverse variation?

b. What is the graph of this function?

c. What is y when $x=4$?

$$a. y = \frac{k}{x} \rightarrow 8 = \frac{k}{2} \quad k=16$$

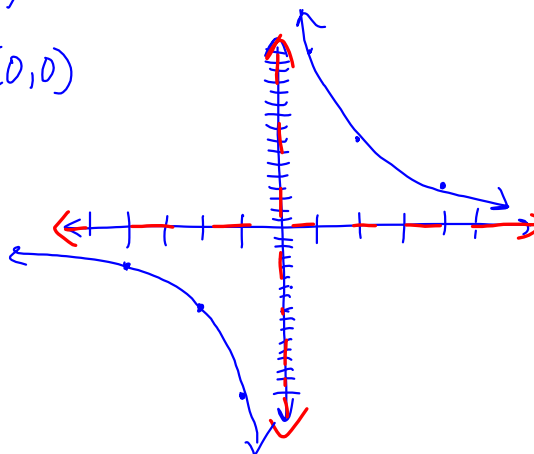
$$y = \frac{16}{x}$$

$$b. (h, k) = (0, 0)$$

$$H.A. y=0$$

$$V.A. x=0$$

x	y	$y = \frac{16}{x}$
2	8	
16	1	
4	4	
1	16	
		x
		y
		-2
		-8
		-4
		-4
		-1
		-16



$$c. y = \frac{16}{x} \quad x=4 \quad y = \frac{16}{4} = \boxed{4}$$

Problem 3:

a. z varies inversely with the product ^(xy) of x and y . When $x=2$ and $y=4$, $z=0.5$. Find z when $x=4$ and $y=9$.

$$z = \frac{k}{xy} \quad \frac{k}{2(4)} = 0.5$$

$$\boxed{z = \frac{4}{xy}}$$

$$8 \cdot \frac{k}{8} = 0.5 \cdot 8$$

$$k = 4$$

$$z = \frac{4}{4 \cdot 9} = \boxed{\frac{1}{9}}$$