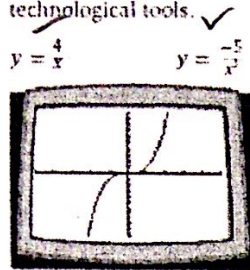


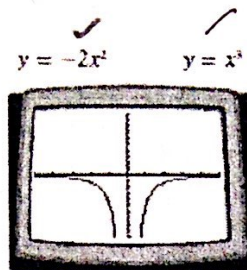
1)

Shown below are graphs of power and inverse power models. The scales are the same on all graphs. Match the graphs to the function rules and explain your reasoning in each case. Do not use any technological tools.



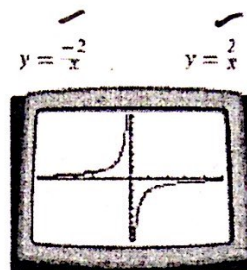
Rule: $y = x^3$

Explanation:
 • Direct-continuous
 • odd exp: 1 & 3
 • positive



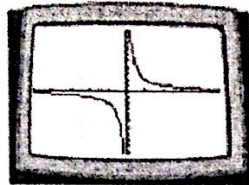
Rule: $y = -\frac{5}{x^2}$

Explanation:
 • inverse-split
 • even exp: 1 & 2
 • negative flip



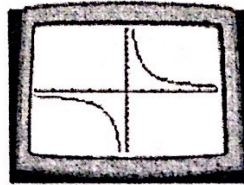
Rule: $y = -2/x$

Explanation:
 • inverse-split
 • odd exp: 1 & 3
 • negative: flip



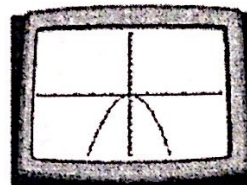
Rule: $y = 2/x$

Explanation:
 • inverse-split
 • odd exp: 1 & 3
 • positive
 K smaller



Rule: $y = 4/x$

Explanation:
 • inverse-split
 • odd exp: 1 & 3
 • positive
 K bigger



Rule: $y = -2x^2$

Explanation:
 • direct
 • even exp: 1 & 2
 • negative: flipped

2. The surface area of a cube S is related to the length of a side of the cube l by the formula $S = 6l^2$.
- a. Is this relationship an example of direct variation, inverse variation, or neither? Explain your reasoning. Direct variation; as length increases, surface area increases

- b. Calculate the surface area of a cube with side length 3 cm. Show your work.

$$S = 6(3)^2$$

$$6(9)$$

$$S = 54 \text{ cm}^2$$

- c. What is the side length of a cube that has a surface area of 105.84 cm²? Show your work.

$$\frac{105.84}{6} = \frac{6l^2}{6}$$

$$\sqrt{17.64} = \sqrt{l^2}$$

$$l = 4.2$$

cover is inversely proportional to the depth, d , of the concrete.

- a) Write a model for the relationship between the area and the depth of a truckload of poured concrete.

$$A = \frac{300}{d}$$

- b) What area will the concrete cover if it is poured to a depth of .5ft? A depth of 1 ft? A depth of 1.5ft?

$$\frac{300}{.5}$$

$$A = 600$$

$$\frac{300}{1}$$

$$A = 300$$

$$\frac{300}{1.5}$$

$$A = 200$$

- c) When the concrete is poured into a circular area, the depth of the concrete is inversely proportional to the square of the radius r . Write a model for this relationship.

$$d = \frac{300}{r^2}$$

- 4) Suppose you drive a car 392 mi on one tank of gas. The tank holds 14 gallons. The numbers of miles traveled varies directly with the number of gallons of gas you use.

- a. Write an equation that relates miles traveled to gallons of gas used.

$$M = k \cdot g \quad 392 = k \cdot 14$$

$$k = 28$$

$$M = 28g$$

- b. You only have enough money to buy 3.7 gallons of gas. How far can you drive before refueling?

$$M = 28(3.7) = 103.6 \text{ miles}$$

- c. Last year you drove 11,700 mi. About how many gallons of gas did you use?

$$11700 = 28g$$

$$g \approx 417.9$$

- d. Suppose the price of gas averaged \$1.57 per gallon last year. Find the cost per mile.

$$\frac{\$1.57(417.9)}{11700}$$

$$\approx 0.06 \text{ per mile}$$

- 5) Determine if y varies directly or inversely with x , and write the constant of proportionality.

a.			
x	↑	y	↑
9		6	$\frac{2}{3}$
12		8	$\frac{2}{3}$
15		10	$\frac{2}{3}$
18		12	$\frac{2}{3}$

direct? $y = kx$
 $k = \frac{y}{x}$

direct
 $k = \frac{2}{3}$

b.			
x	↑	y	↑
27		9	$\frac{1}{3}$
30		10	$\frac{1}{3}$
60		20	$\frac{1}{3}$
90		30	$\frac{1}{3}$

direct? $y = kx$
 $k = \frac{y}{x}$

direct
 $k = \frac{1}{3}$

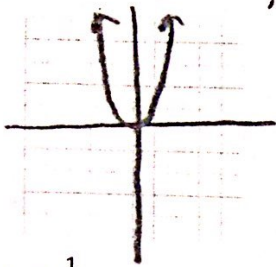
c.			
x	↑	y	↓
4		16	64
8		8	64
16		4	64
32		2	64

inverse? $y = \frac{k}{x}$
 $k = yx$

inverse
 $k = 64$

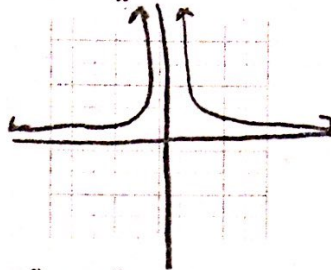
6) In each of the following equations **SKETCH A GRAPH** of each of the following equations **AND EXPLAIN** why they have that general shape using the toolkit on power models.

a) $y = 2x^2$



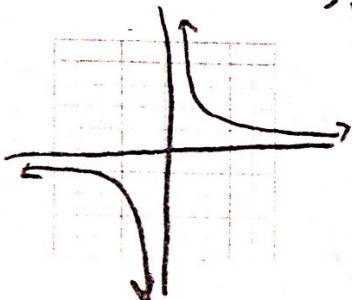
- direct (0,0)
- even exp
1 : 2
- positive

e) $y = \frac{1}{x^2}$



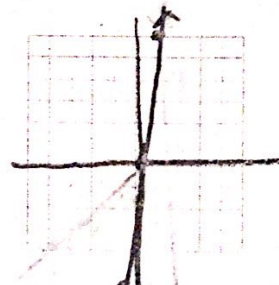
- inverse split
- even exp
1 : 2
- positive

b) $y = \frac{1}{x^3}$



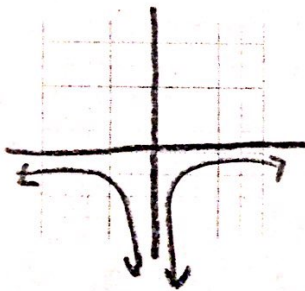
- inverse split
- odd exp
1 : 3
- positive

f) $y = 6x$



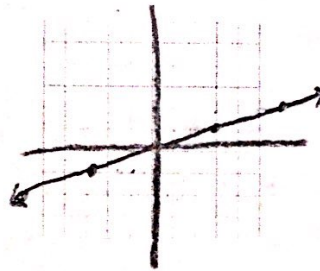
Linear
slope of $\frac{6}{1}$

c) $y = \frac{-1}{x^2}$



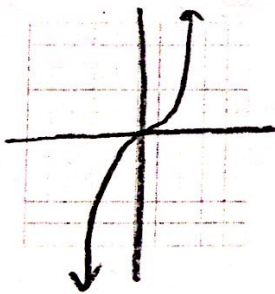
- inverse split
- even exp
1 : 2
- neg. flip

g) $y = \frac{x}{3}$



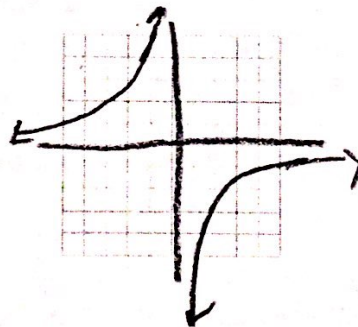
Linear
slope of $\frac{1}{3}$

d) $y = x^5$



- direct (0,0)
- odd exp
1 : 3
- positive

h) $y = \frac{-5}{x}$



- inverse
- odd exp
1 : 3
- negative flip
- k bigger
further
from
origin

7) Write a sentence describe each inverse or direct relationship. In the format: "Variable _____ varies _____ to variable _____ with constant of proportionality _____."

a) The area of the light circle produced is related to the distance x to the lighted object by $A = 0.1x^2$

Variable Area varies directly to variable x^2 w/cop 0.1

b) Scientific theories predict that roll time T and platform height H will be related by the

$$\text{Function } T = \frac{2}{\sqrt{H}}$$

Variable T varies inversely to variable \sqrt{H} w/cop 2

c) The intensity of light shining on an object x feet from a spotlight is given by $I = \frac{2,500}{x^2}$

Variable I varies inversely to variable x^2 w/cop 2500

d) The rule $E = 7.5h$ gives wages earned at a job as a function of number of hours worked.

Variable E varies directly to variable h w/cop 7.5