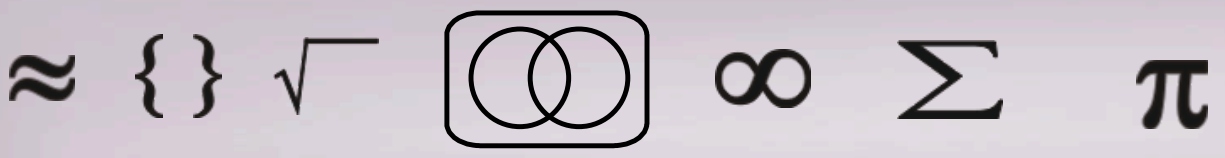


Math 1030 #14a

Linear Function

Linear Equation

Linear Modeling

Slope and Rate of Change

Rate of Change

Price-Demand Function

A Linear Function has

- a constant rate of change
- a straight-line graph

steepness is same at every pt

The Slope of the line is the rate of change.

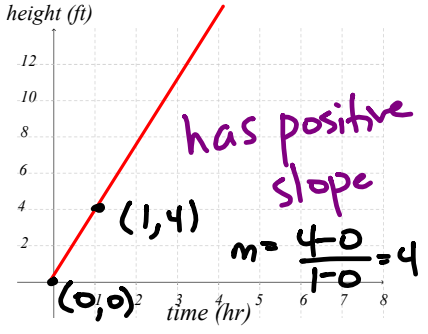
The greater the rate of change, the steeper the slope.

for 2 pts on the line (x_1, y_1) and (x_2, y_2)

$$\text{rate of change} = \text{slope} = \frac{\text{change in dependent variable}}{\text{change in independent variable}} = \frac{\text{rise}}{\text{run}} = \frac{y_2 - y_1}{x_2 - x_1}$$

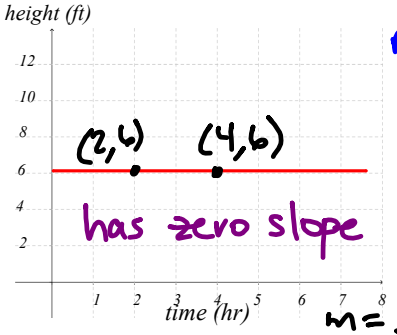
vert. change / horiz. change

EX 1: Discuss the slope (rate of change) in each of these graphic examples.



has positive slope

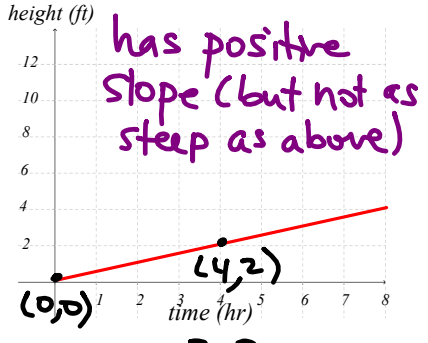
$m = \frac{4-0}{1-0} = 4$



has zero slope

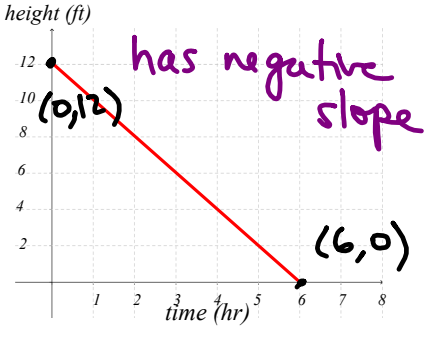
rate of change units = ft/hr

$m = \frac{6-6}{4-2} = \frac{0}{2} = 0$



has positive slope (but not as steep as above)

$m = \frac{2-0}{4-0} = \frac{2}{4} = \frac{1}{2}$



has negative slope

$m = \frac{12-0}{0-6} = \frac{12}{-6} = -2$

A Price-Demand Function is a good example of slope.

EX 2: Write a statement that describes how one variable varies with respect to the other. Then answer the questions.

A gas station owner finds for each 2-cent increase in the price of gasoline, she sells 120 fewer gallons of gas per week.

sales decrease as price increases

price ($) is one variable, sales (gallons) is another variable

(indep. var.) (dep. var.)

a) How much more or less will she sell if she raises the price by 10¢ per gallon?

note: 10¢ = 5 2-¢ increments

⇒ she will sell 5(120) = 600 fewer gallons per week

b) What if she decreases the price by 5¢ per gallon?

note: 5¢ = 2.5 2-¢ increments

⇒ she will sell 2.5(120) = 300 more gallons per week

c) What is the slope (rate of change) in this problem.

$$\text{slope} = \text{rate of change} = \frac{\text{dep. var. change}}{\text{indep. var. change}} = \frac{\text{change in sales}}{\text{change in price}}$$

$$= \frac{-120}{2} \text{ gal/¢} = -60 \text{ gal/¢}$$