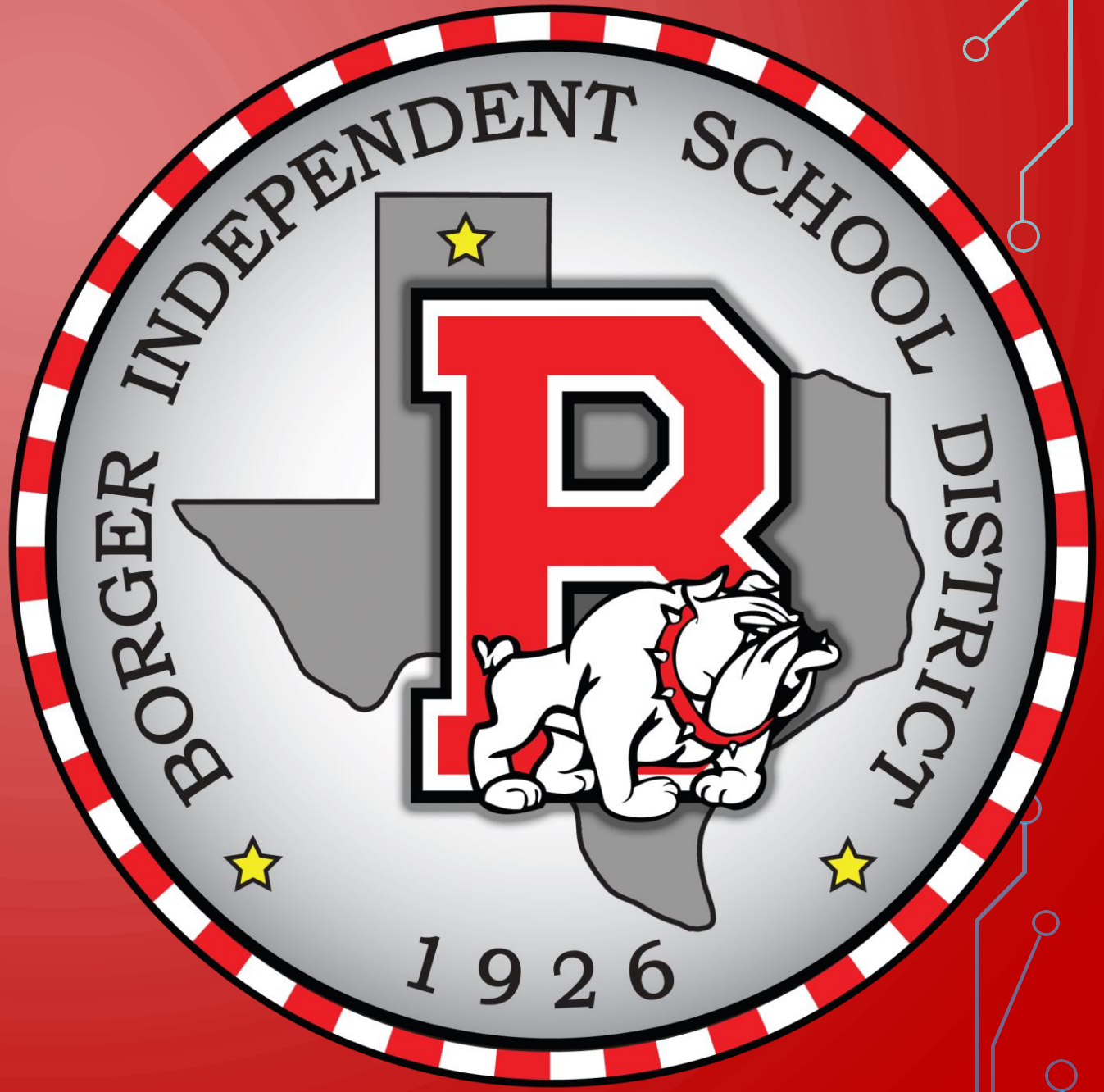
BOARD NOTES

24 SEPTEMBER 2018



CC PRECALCULUS CHAPTER 3 – LINEAR AND QUADRATIC FUNCTIONS

- SECTION 3.1 - PROPERTIES OF LINEAR FUNCTIONS AND LINEAR MODELS

Objectives:

- Graph Linear Functions
- Use the Average Rate of Change (AROC) to Identify Linear Functions
- Determine whether a linear function is Increasing, Decreasing, or Constant
- Build Linear Models from verbal descriptions

x	$y = f(x) = -3x + 7$	Average Rate of Change $= \frac{\Delta y}{\Delta x}$
−2	13	
		$\frac{10 - 13}{-1 - (-2)} = \frac{-3}{1} = -3$
−1	10	
		$\frac{7 - 10}{0 - (-1)} = \frac{-3}{1} = -3$
0	7	
		−3
1	4	
		−3
2	1	
		−3
3	−2	

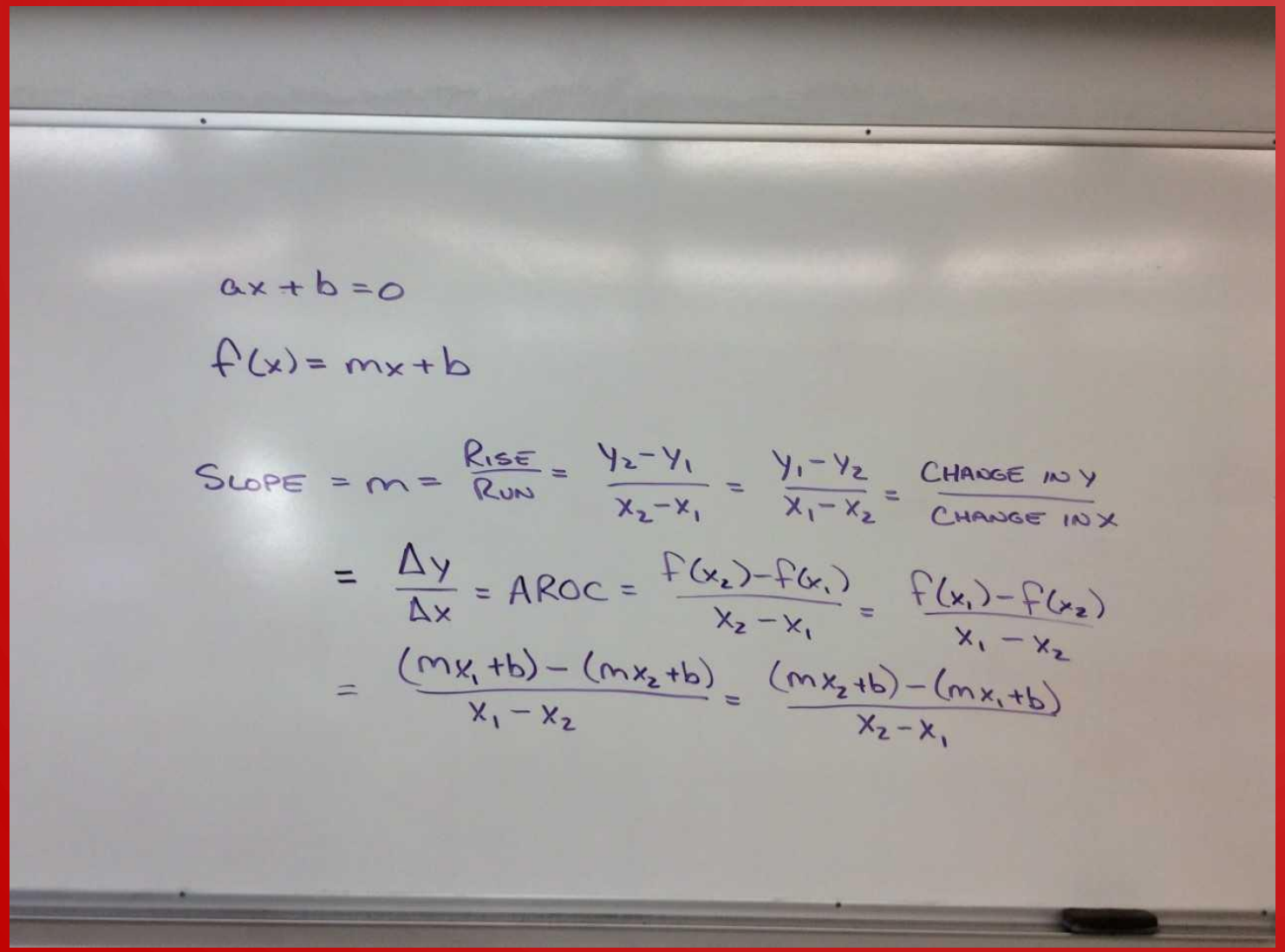
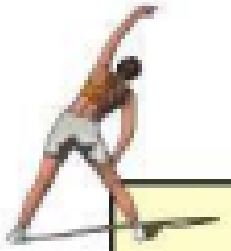

$ax + b = 0$
$f(x) = mx + b$
$\text{SLOPE} = m = \frac{\text{RISE}}{\text{RUN}} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{y_1 - y_2}{x_1 - x_2} = \frac{\text{CHANGE IN } y}{\text{CHANGE IN } x}$
$= \frac{\Delta y}{\Delta x} = \text{AROC} = \frac{f(x_2) - f(x_1)}{x_2 - x_1} = \frac{f(x_1) - f(x_2)}{x_1 - x_2}$
$= \frac{(mx_1 + b) - (mx_2 + b)}{x_1 - x_2} = \frac{(mx_2 + b) - (mx_1 + b)}{x_2 - x_1}$

Table 2

Time (hours), x	Population (grams), y	(x, y)
0	0.09	(0, 0.09)
1	0.12	(1, 0.12)
2	0.16	(2, 0.16)
3	0.22	(3, 0.22)
4	0.29	(4, 0.29)
5	0.39	(5, 0.39)

Table 3



Age, x	Maximum Number of Heartbeats, y	(x, y)
20	50	(20, 50)
30	47.5	(30, 47.5)
40	45	(40, 45)
50	42.5	(50, 42.5)
60	40	(60, 40)
70	37.5	(70, 37.5)

Source: American Heart Association

Straight-line Depreciation

Book value is the value of an asset that a company uses to create its balance sheet. Some companies depreciate assets using straight-line depreciation so that the value of the asset declines by a fixed amount each year. The amount of the decline depends on the useful life that the company assigns to the asset. Suppose a company just purchased a fleet of new cars for its sales force at a cost of $31,500 per car. The company chooses to depreciate each vehicle using the straight-line method over 7 years. This means that each car will depreciate by $\frac{\$31{,}500}{7} = \$4500$ per year.

(a) Write a linear function that expresses the book value V of each car as a function of its age, x, in years.

(b) Graph the linear function.

(c) What is the book value of each car after 3 years?

(d) Interpret the slope.

(e) When will the book value of each car be $9000?

[Hint: Solve the equation $V(x) = 9000$.]

Supply and Demand

The **quantity supplied** of a good is the amount of a product that a company is willing to make available for sale at a given price. The **quantity demanded** of a good is the amount of a product that consumers are willing to purchase at a given price. Suppose that the quantity supplied, S, and the quantity demanded, D, of cellular telephones each month are given by the following functions:

$$S(p) = 60p - 900$$

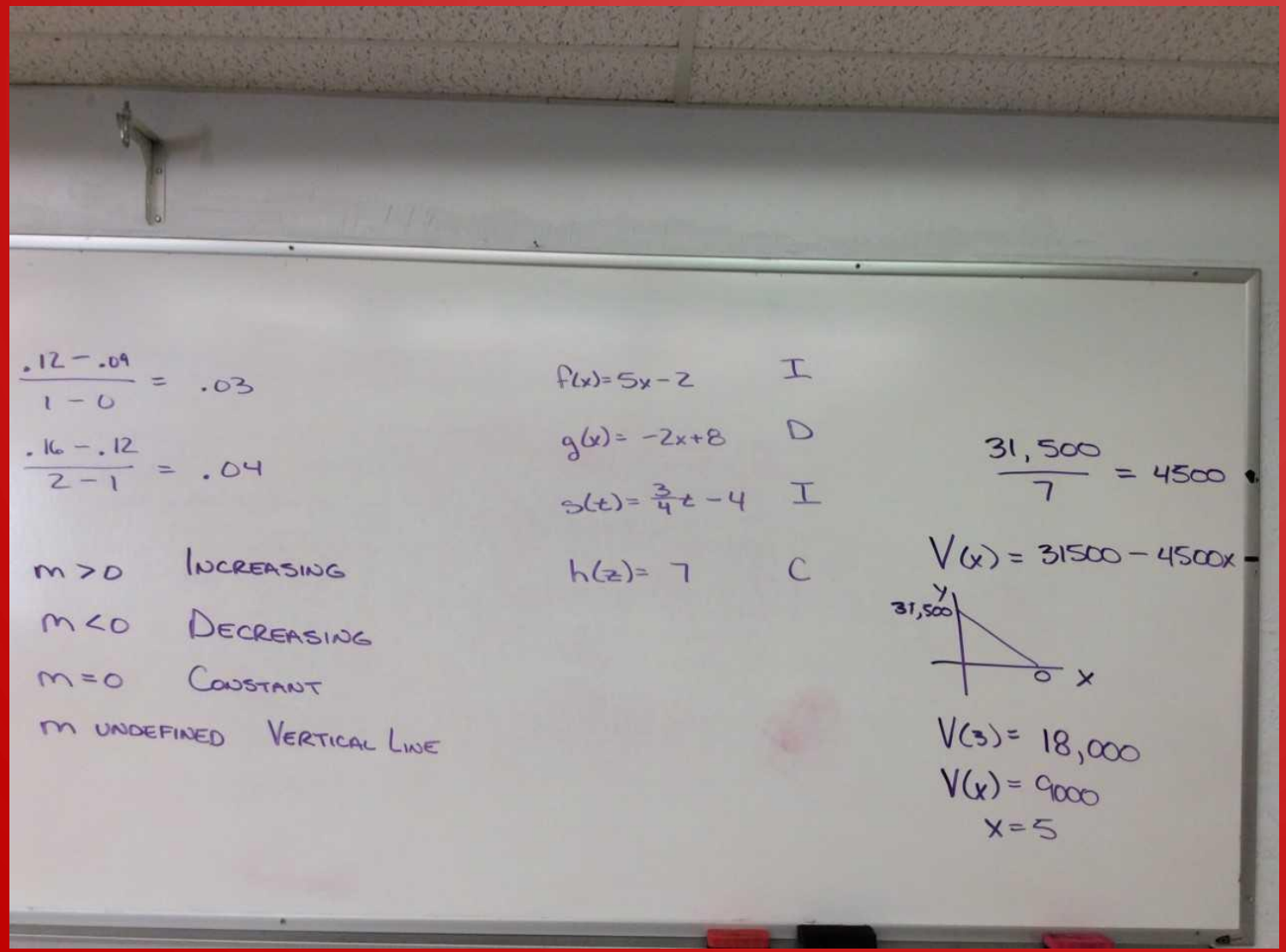
$$D(p) = -15p + 2850$$

where p is the price (in dollars) of the telephone.

(a) The **equilibrium price** of a product is defined as the price at which quantity supplied equals quantity demanded. That is, the equilibrium price is the price at which $S(p) = D(p)$. Find the equilibrium price of cellular telephones. What is the **equilibrium quantity**, the amount demanded (or supplied) at the equilibrium price?

(b) Determine the prices for which quantity supplied is greater than quantity demanded. That is, solve the inequality $S(p) > D(p)$.

(c) Graph $S = S(p)$ and $D = D(p)$, and label the **equilibrium point**, the point of intersection of S and D.


$\frac{.12-.09}{1-0} = .03$
$\frac{.16-.12}{2-1} = .04$
$m > 0$ INCREASING
$m < 0$ DECREASING
$m = 0$ CONSTANT
m UNDEFINED VERTICAL LINE
$f(x) = 5x - 2$ I
$g(x) = -2x + 8$ D
$s(t) = \frac{3}{4}t - 4$ I
$h(z) = 7$ C
$\frac{31,500}{7} = 4500$
$V(x) = 31500 - 4500x$
31,500
y
x
$V(3) = 18,000$
$V(x) = 9000$
$x = 5$