

Math 102 - Fall 2012 - Test 1

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Name

KEY

Instructions. Only calculators are allowed on this examination. Each problem is worth 10 points, unless otherwise specified. **Always use the appropriate wording and units of measure in your answers (when applicable).**

SHOW YOUR WORK NEATLY, PLEASE (no work, no credit).

1. A company buys and retails baseball caps. The total cost function is linear, the total cost for 200 caps is \$2680, and the total cost of 500 caps is \$3530. Write the equation that models this cost function.

$$Y = \text{TOTAL COST IN DOLLARS} ; X = \text{CAPS SOLD}$$

$$\text{DATA: } \begin{array}{l} x=200 \rightarrow y=2680 \\ x=500 \rightarrow y=3530 \end{array} \rightarrow \text{slope} = \frac{\text{MARGINAL COST}}{\text{COST}} = \frac{3530 - 2680}{500 - 200} = \frac{17}{6} \text{ } \$/\text{UNIT}$$

$$Y = \frac{17}{6}X + b \quad \rightarrow \quad 2680 = \frac{17}{6}(200) + b \quad \rightarrow \quad b = \frac{6340}{3}$$

$$\text{PLUG- A POINT: } (200, 2680) \quad \begin{array}{l} -1700/3 \\ -1700/3 \end{array}$$

$$\text{THUS: } Y = \frac{17}{6}X + \frac{6340}{3} \quad \text{OR} \quad Y = 2.8\bar{3}X + 2113.\bar{3}$$

2. Write the equation of the line passing through (3, -1) and parallel to the line $3x + 2y = -5$.

$$\text{"PARALLEL LINES" = "SAME SLOPE": } \begin{array}{l} 3x + 2y = -5 \rightarrow 2y = -3x - 5 \\ -3x \quad -3x \quad \frac{2y}{2} \quad \frac{-3x}{2} \quad \frac{-5}{2} \end{array}$$

$$\rightarrow Y = -\frac{3}{2}X - \frac{5}{2} \rightarrow \text{slope} = -\frac{3}{2}$$

$$Y = -\frac{3}{2}X + b \quad \rightarrow \quad -1 = -\frac{3}{2}(3) + b \quad \rightarrow \quad b = \frac{7}{2}$$

$$\text{PLUG- } (3, -1) \quad \begin{array}{l} +7/2 \\ +7/2 \end{array}$$

$$\text{THUS: } Y = -\frac{3}{2}X + \frac{7}{2}$$

3. Write the equation of the line passing through the points (1, 1) and (2, -3).

$$\text{SLOPE} = \frac{\Delta Y}{\Delta X} = \frac{-3-1}{2-1} = -4$$

POINT-SLOPE FORM: $y - 1 = -4(x - 1) \rightarrow y = -4x + 4 + 1 \rightarrow$

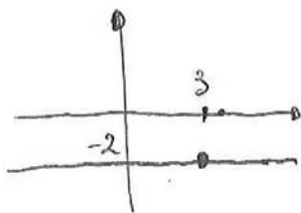
$$\rightarrow y = -4x + 5$$

4. Write in a standard form the equation of the line $y + 1 = -2(x - 1)$.

STANDARD FORM OF A LINE: $AX + BY = C$

$$\begin{array}{rcl} y + 1 & = & -2x + 2 \\ +2x - 1 & +2x & -1 \end{array} \rightarrow 2x + y = 1$$

5. Write the equation of the horizontal line passing through (3, -2).



$$y = -2$$

($x = 3$ IS A VERTICAL LINE)

6. In seawater, the pressure p is related to the depth d according to the model $33p - 18d = 496$, where d is the depth in feet and p is in pound per square inch.

(a) (7 points) What is the slope of the graph of this function?

(b) (8 points) Using the appropriate units of measure, interpret this slope as a rate of change.

(a) p IS A FUNCTION OF d , SO THAT p IS OUR y AND d OUR x :

$$33p - 18d = 496 \rightarrow \begin{array}{r} 33p \\ +18d \\ \hline \end{array} = \begin{array}{r} 18d \\ +496 \\ \hline \end{array} \rightarrow p = \frac{6}{11}d + \frac{496}{33}$$

$$\text{SLOPE} = \frac{6}{11} \frac{\text{lb per in}^2}{\text{ft}} \quad \left[\text{NOTE: } \frac{6}{11} = .54 \right]$$

(b) RATE OF CHANGE: FOR EVERY 11 FT INCREASE IN DEPTH THE PRESSURE INCREASES OF 6 POUND PER SQUARE INCH.

NOTE: YOU MIGHT DECIDE THAT p IS THE INDEPENDENT VARIABLE (OUR x)

THEN YOU WOULD SWAP THE WORDS: SLOPE $\frac{11}{6}$ MEANS "TO EVERY 6 POUNDS PER SQUARE INCH INCREASE IT CORRESPONDS AN 11 FEET INCREASE IN DEPTH"

7. Solve the system of linear equations $\begin{cases} x - 2y = 1 \\ 2x + 5y = -2 \end{cases}$

BY SUBSTITUTION EQ 1 $\rightarrow x = 2y + 1$

$$\text{PLUG IN EQ 2: } 2(2y + 1) + 5y = -2 \rightarrow$$

$$\rightarrow 4y + 2 + 5y = -2 \rightarrow 9y = -4 \rightarrow$$

$$\rightarrow y = -\frac{4}{9} \quad \text{EQ 1} \rightarrow x = 2\left(-\frac{4}{9}\right) + 1 = \frac{1}{9}$$

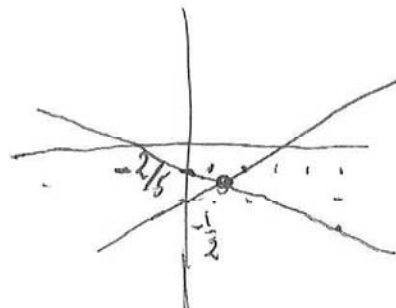
$$\text{SOLUTION: } x = \frac{1}{9}, y = -\frac{4}{9}$$

$\frac{1}{9}$ $-\frac{4}{9}$
 $\frac{1}{9}$ $-\frac{4}{9}$

BY GRAPH, YOU NEED TO SOLVE FOR y :

$$\text{EQ 1} \rightarrow \frac{-2y}{-2} = \frac{-x+1}{-2} \rightarrow y = \frac{1}{2}x - \frac{1}{2}$$

$$\text{EQ 2} \rightarrow \frac{5y}{5} = \frac{-2x-2}{5} \rightarrow y = -\frac{2}{5}x - \frac{2}{5}$$



8. (15 points) Sue chooses one money market fund that pays 6.2% and a mutual fund that has more risk but has averaged 9.2% per year. If she has \$300,000 to invest and her goal is to average 7.6% per year with minimal risk, how much should she invest in each fund?

ITEMS FUNDS	Q K\$	R %	Q R VALUE RETURNED
MONEY MARKET	X	.062	.062X
MUTUAL	Y	.092	.092Y
TOTALS	300	.076	22.8

$$\begin{cases} X + Y = 300 \\ .062X + .092Y = 22.8 \end{cases}$$

MULTIPLY
ADD

$$EQ_1: Y = 300 - X$$

$$EQ_2: .062X + .092(300 - X) = 22.8$$

$$\rightarrow .062X + 27.6 - .092X = 22.8$$

$$\rightarrow \begin{array}{r} -.03X = -4.8 \\ \underline{-.03} \quad \underline{-.03} \end{array} \rightarrow X = 160 \rightarrow$$

$$\rightarrow Y = 300 - 160 = 140$$

SUE SHOULD INVEST \$160,000 IN MONEY MARKET FUNDS AND \$140,000 IN A MUTUAL FUND.

9. A jewelry maker has total revenue for her bracelets given by $R = 89.75x$ and incurs a total cost of $C = 23.50x + 1192.50$, where x is the number of bracelets produced and sold. Find the number of units that gives break even for this product.

"BREAK EVEN" MEANS " $R = C$ ", OR "ZERO PROFIT"

$$R = C \rightarrow 89.75X = 23.50X + 1192.50$$

$$\rightarrow \begin{array}{r} 66.25X = 1192.5 \\ \underline{66.25} \quad \underline{66.25} \end{array} \rightarrow X = 18$$

18 BRACELETS WILL GIVE BREAK EVEN

