

Math 1090-1 Test 1

Name: KEY

ID# _____

Email: _____

To receive full credit you must show all of your work in a neat and organized manner. Write your answers and solutions in the space provided. Please box your answers. You may use a four function calculator.

Math 1090-1 Test 1

1. (5 points) Write the inequality $5 < x \leq 8$ in interval notation, name the type of interval, and graph it on a real number line.

$$(5, 8]$$

Half-open interval



2. (5 points) Factor completely $3x^2 - x - 2$.

$$3x^2 - x - 2$$

$$3x^2 - 3x + 2x - 2$$

$$3x(x-1) + 2(x-1)$$

$$(3x+2)(x-1)$$

3. (a) (5 points) Find the slope-intercept form of the line between the points $(-1, 2)$ and $(2, 8)$.

$$m = \frac{8-2}{2-(-1)} = \frac{6}{3} = 2$$

$$y-2 = 2(x-(-1))$$

$$y-2 = 2x+2$$

$$\boxed{y = 2x + 4}$$

- (b) (5 points) Find the slope-intercept form of the line which passes through the point $(2, 3)$ and is parallel to the line $2y + 2x = 4$.

$$2y + 2x = 4$$

$$2y = -2x + 4$$

$$y = -x + 2 \quad m = -1$$

$$y-3 = -1(x-2)$$

$$y-3 = -x+2$$

$$\boxed{y = -x + 5}$$

4. (10 points) A retired couple has \$100,000 to invest and wants to earn \$7,500 per year in interest. The safer investment yields 5%, but they can supplement their earnings by investing some of their money at 10%. How much should they invest at each rate to earn \$7,500 per year?

$$x + y = 100,000 \Rightarrow x = 100,000 - y$$

$$0.05x + 0.1y = 7500$$

$$0.05(100,000 - y) + 0.1y = 7500$$

$$5,000 - 0.05y + 0.1y = 7500$$

$$.05y = 2500$$

$$y = 50,000$$

$$x = 100,000 - 50,000 = 50,000$$

INVEST \$50,000 AT 10% AND \$50,000 AT 5%

5. A certain commodity has fixed costs for \$1500 and variable costs for \$25 per unit. The commodity is sold for \$50 per unit.

(a) (3 points) What is the total cost function?

$$C(x) = 1500 + 25x$$

(b) (2 points) What is the total revenue function?

$$R(x) = 50x$$

(c) (3 points) What is the profit function?

$$P(x) = R(x) - C(x) = 50x - (1500 + 25x)$$

$$P(x) = 25x - 1500$$

(d) (2 points) What is the marginal profit?

$$\overline{MP} = 25$$

THIS IS THE SLOPE
OF THE PROFIT FUNCTION.

(e) (5 points) What is the break-even point?

$$0 = 25x - 1500$$

$$1500 = 25x$$

$$x = 60 \quad @ \quad x = 60, \quad R(60) = 50(60) = 3000$$

SO THE BREAK EVEN POINT IS
(60, 3000)

6. A certain product has supply and demand functions $p = 3q + 10$ and $p = -2q + 80$, respectively

(a) (5 points) If the price is \$40, how many units are supplied and how many are demanded?

SUPPLIED:

$$P = 3q + 10$$

$$40 = 3q + 10$$

$$30 = 3q$$

$$\boxed{q = 10}$$

DEMANDED:

$$P = -2q + 80$$

$$40 = -2q + 80$$

$$2q = 40$$

$$\boxed{q = 20}$$

(b) (5 points) Is the price likely to increase from \$40 or decrease from it? Explain why.

THE PRICE WILL MOST LIKELY INCREASE BECAUSE THERE IS A MARKET SHORTAGE, I.E. THE DEMAND IS LARGER THAN THE SUPPLY.

(c) (5 points) Find the market equilibrium point.

$$3q + 10 = -2q + 80$$

$$5q = 70$$

$$q = 14$$

$$@ q = 14, P = 3(14) + 10 = 52$$

6

SO THE MARKET EQUILIBRIUM POINT IS $(14, 52)$

7. (Extra Credit) Solve the following system of equations by using the method of elimination.

$$x + y - z = 12$$

$$2y - 3z = -7$$

$$3x + 3y - 7z = 0$$

$$\begin{array}{r} x + y - z = 12 \\ 2y - 3z = -7 \\ 3x + 3y - 7z = 0 \end{array} \quad \begin{array}{l} | \\ | \\ | \\ | \\ | \end{array} \quad \begin{array}{l} \text{Multiply (1) BY 3 and add} \\ \text{to (3)} \\ -3x - 3y + 3z = -36 \\ \underline{3x + 3y - 7z = 0} \\ -4z = -36 \end{array}$$

$$x + y - z = 12$$

$$2y - 3z = -7$$

$$-4z = -36 \Rightarrow$$

$$\boxed{z = 9}$$

$$2y - 3(9) = -7$$

$$2y = 20$$

$$\boxed{y = 10}$$

$$x + 10 - 9 = 12$$

$$\boxed{x = 11}$$

CHECK:

$$11 + 10 - 9 = 12 \quad \checkmark$$

$$2(10) - 3(9) = -7 \quad \checkmark$$

$$3(11) + 3(10) - 7(9) = 0 \quad \checkmark$$

