| NAME: (1 pt) | NUMBER: (1 pt) |
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MAT 119, Finite Mathematics, Dr. Carol J.V. Fisher
This exam is closed book, closed notes, closed neighbor, and open mind.
You may use a calculator.
Show work leading to answers to receive full credit. Good luck!

1. (16 pts total)  Suppose that the cost to make $x$ water filters (in dollars) is $C(x) = 20x + 20,000$.
Each water filter sells for $30.00.

(2 pts) What are the fixed costs for manufacturing the water filters?

(2 pts) How much does it cost to manufacture each water filter?
(That is, what are the variable costs for manufacturing the water filters?)

(2 pts) Give a formula for the revenue function, $R(x)$.

(2 pts) Give a formula for the profit function, $P(x)$.

(2 pts) In words, what is meant by the 'break-even point'?

(2 pts) Which (if any) of the following equations could be used to find the 'break-even point'?
(Circle all appropriate equation(s).)
- $P(x) = 0$
- $R(x) = C(x)$
- $R(x) - C(x) = 0$
- $C(x) - R(x) = 0$
- $R(x) + C(x) = 0$

(4 pts) How many water filters must be sold for the company to break even?

2. (4 pts) Let $p$ denote the price of an item.
Let $x$ denote the quantity of the item that is supplied or demanded in a free market.
One of the following equations describes a demand curve, and the other describes a supply curve.
Decide which is which, and write a sentence or two to justify your answer.

(4 pts) Then, find the market equilibrium price.

$$x = 0.8p + 1$$
$$x = -0.2p + 1.8$$

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3. (12 pts total)  Consider the line $3x + 4y = 12$.

(2 pts) The slope of this line is: _____

(2 pts) This line crosses the $y$-axis at: _____

(2 pts) This line crosses the $x$-axis at: _____

(2 pts) Write the equation of any line that is parallel to this line:
_____

(4 pts) Graph the line $3x + 4y = 12$ in the space provided below:

4. (10 pts) Michael has a total of $2000 on deposit with two savings institutions. One pays interest at the rate of 6% per year, whereas the other pays interest at the rate of 8% per year. Suppose Michael earns a total of $144 in interest in a single year. How much does he have on deposit in each institution?

(For full credit, you must show the equation(s) that you are solving to reach your answer, and must clearly show how you are solving the equation(s).)

Answer:

the amount earning 6% interest is: _____

the amount earning 8% interest is: _____

5. (12 pts) In the spaces provided below, graph each of the following linear inequalities or system of inequalities:

| $x \geq 0$ | $y \geq 0$ | $x \geq 0$ and $y \geq 0$ | $y < x + 2$ |

6. (10 pts) (setting up a linear programming problem)
National Business Machines manufactures two models of fax machines: A and B. Each model A costs $100 to make, and each model B costs $150. The profits are $30 for each model A and $40 for each model B fax machine. If the total number of fax machines demanded per month does not exceed 2500 and the company has earmarked no more than $600,000/month for manufacturing costs, how many units of each model should National make each month in order to maximize its monthly profit?
SET UP (but DO NOT SOLVE) this problem.
(3 pts) Give NAMES to your unknowns:
LET _____ = _____
LET _____ = _____

OBJECTIVE FUNCTION:

_____

CONSTRAINTS (inequalities that define the FEASIBLE SET):


7. (6 pts) Find the maximum and/or minimum value(s) of the objective function on the given feasible set S:


8. (10 pts) Solve the linear programming problem by the method of corners: Maximize
$P = 2x + 3y$
subject to:
$x + y \leq 6$
$2y < x$
$x \geq 0$
$y \geq 0$

9. (12 pts) Use the Gauss-Jordan Elimination Method to solve the following system:

$$3x + 8z = 9 + 2y$$
$$-2x + 2y = 3 - z$$
$$x + 2y - 3z = 8$$

(5 pts) What is the augmented matrix for this system?

(7 pts) Clearly label your row operations (so you can get partial credit, even if you make an arithmetic mistake).

Save this problem for last! You can get full credit, without finishing, providing you illustrate a reasonable number of steps of a correct solution approach. You may use the back of this sheet for additional space, if needed.