M118
FALL 2000

QUIZ 17

NAME: _____

SET UP FOR PROBLEMS 1 AND 2: You can buy containers of pure water from the US Filter Corp. - the A-type, the B-type, and the C-type.

A) The A type contains 2000 liters of pure water and costs $250.

B) The B type contains 3000 liters of pure water and costs $450.

C) The C type contains 4000 liters of pure water and costs $700.

You have $35,000 available for the purchase of these containers. You can sell all of the pure water purchased, but warehouse considerations prevent you from ordering more that 150,000 liters of water. The profit derived from the sale of an A-type container is $500, the profit derived from the sale of a B-type is $750, and the profit derived from the sale of a C-type is $1100. How many A-type, how many B-type, and how many C-type containers should you purchase with your $35,000 in order to maximize profit? (Your final answer may be a fraction - from that answer you will later extract the appropriate information.)

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1) (20 PTS.) For the linear programming problem corresponding to this set-up, what is the objective function? Fill in the blanks below and define the variables that you will use. Then give the objective function in terms of those variables. Let,

x = # of A-type containers purchased

y = # of B-type containers purchased

z = # of C-type containers purchased.

OBJECTIVE FUNCTION: $500x + 750y + 1100z$

2) (30 PTS.) For the linear programming problem corresponding to this set-up, list below the constraint equations. There may be more blank lines than constraint equations.

$250x + 450y + 700z \leq 35{,}000$	$x \geq 0$
$2000x + 3000y + 4000z \leq 150{,}000$	$y \geq 0$
	$z \geq 0$

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NAME: _____

SET UP FOR PROBLEMS 1 AND 2: You can buy containers of pure water from the US Filter Corp. - the A-type, the B-type, and the C-type.

A) The A type contains 2000 liters of pure water and costs $200.

B) The B type contains 3000 liters of pure water and costs $450.

C) The C type contains 4000 liters of pure water and costs $700.

You have $45,000 available for the purchase of these containers. You can sell all of the pure water purchased, but warehouse considerations prevent you from ordering more that 150,000 liters of water. The profit derived from the sale of an A-type container is $500, the profit derived from the sale of a B-type is $750, and the profit derived from the sale of a C-type is $1000. How many A-type, how many B-type, and how many C-type containers should you purchase with your $45,000 in order to maximize profit? (Your final answer may be a fraction - from that answer you will later extract the appropriate information.)

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1) (20 PTS.) For the linear programming problem corresponding to this set-up, what is the objective function? Fill in the blanks below and define the variables that you will use. Then give the objective function in terms of those variables. Let,

x = # of A-type containers purchased

y = # of B-type containers purchased

z = # of C-type containers purchased

OBJECTIVE FUNCTION: $500x + 750y + 1000z$

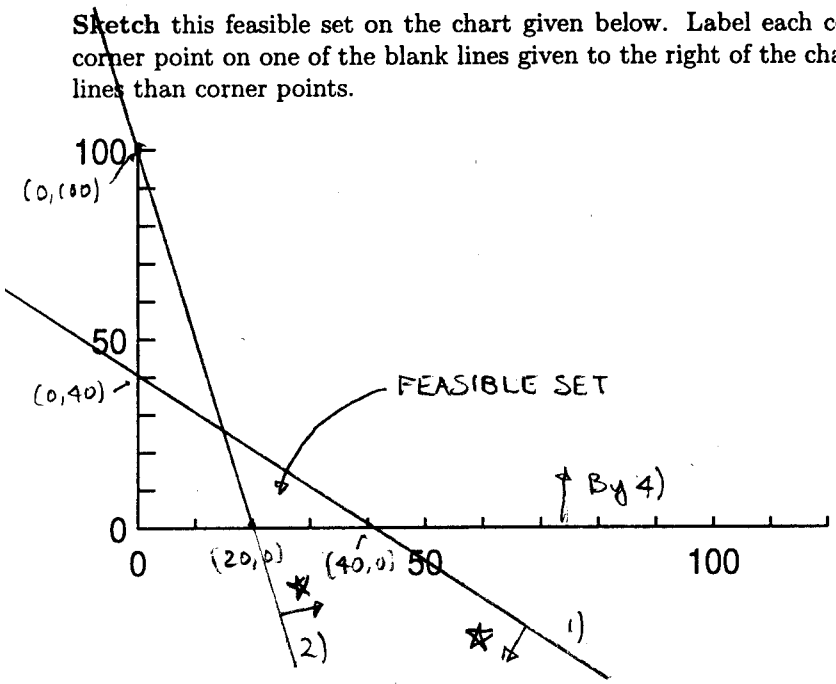
2) (30 PTS.) For the linear programming problem corresponding to this set-up, list below the constraint equations. There may be more blank lines than constraint equations.

$200x + 450y + 700z \le 45{,}000$	$x \ge 0$
$2000x + 3000y + 4000z \le 150{,}000$	$y \ge 0$
	$z \ge 0$

3) (30 PTS.) Consider the feasible set described by the following inequalites

$$\begin{array}{lrl} 1) & x + y & \leq 40 \\ 2) & 5x + y & \geq 100 \\ 3) & x & \geq 0 \\ 4) & y & \geq 0\,. \end{array}$$

Sketch this feasible set on the chart given below. Label each corner point and give the location of that corner point on one of the blank lines given to the right of the chart. There may or may not be more blank lines than corner points.



CORNER PT LOCATION	VALUE OF $10x+12y$
(20,0)	200
(40,0)	400
(15,25)	450

MAX VALUE

1) (0,40), (40,0) lie on the line

2) $x=0 \Rightarrow y=100 \Rightarrow (0,100)$ on the line
$y=0 \Rightarrow 5x=100 \Rightarrow (20,0)$ on the line

★ (0,0) satisfies 1) but not 2)

Corner points: A) (20,0)
B) (40,0)
C) $-(x+y=40)$ BY 1)
$5x+y=100$ BY 2)
$4x = 60$

$x=15 \Rightarrow y=25$ (15,25) is a corner pt

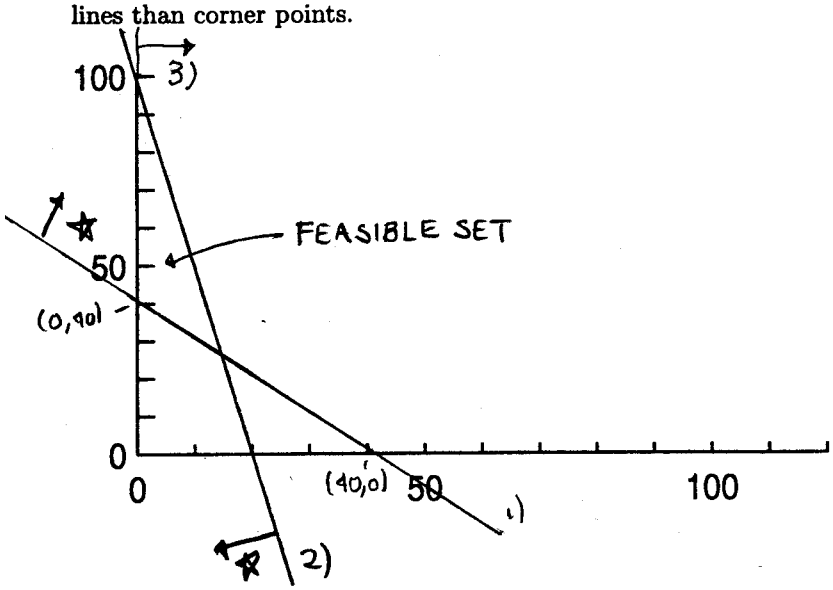
4) (20 PTS.) Find the maximum of the function $10x + 12y$ on the feasible set of problem 3.

Answer: Maximum Value = 450

3) (30 PTS.) Consider the feasible set described by the following inequalites

$$\begin{array}{lrl} 1) & x + y & \geq 40 \\ 2) & 5x + y & \leq 100 \\ 3) & x & \geq 0 \\ 4) & y & \geq 0\,. \end{array}$$

Sketch this feasible set on the chart given below. Label each corner point and give the location of that corner point on one of the blank lines given to the right of the chart. There may or may not be more blank lines than corner points.



LOCATION OF CORNER PT.	VALUE OF $11x+2y$
(0,40)	80
(0,100)	200
(15,25)	215

MAX VALUE

1) (0,40) & (40,0) lie on the line.

2) $x=0 \Rightarrow y=100 \Rightarrow (0,100)$ on the line
$y=0 \Rightarrow 5x=100 \Rightarrow (20,0)$ on the line.

★ (0,0) satisfies 2) but not 1).

Corner points: A) (0,40)
B) (0,100)
C) $-(x+y=40)$ by 1)
$5x+y=100$ by 2)
$4x = 60$
$x=15 \Rightarrow y=25$ (15,25) is a corner pt.

4) (20 PTS.) Find the maximum of the function $11x + 2y$ on the feasible set of problem 3.

Answer: Maximum Value = 215