

DO NOT TURN THIS PAGE UNTIL YOU ARE INSTRUCTED TO DO SO

- ❖ Write your name below on the space provided.
- ❖ This test has a total of 5 pages.
- ❖ Work the problem in the space provided. If you need more space, write on the back of the test.
- ❖ To insure maximum credit, show your work. In general, full credit will not be given for unsupported answers.
- ❖ Look only at your test. Don't give me the impression that you are cheating.
- ❖ Be sure to write neatly. If I cannot read what was written, do not expect the problem to be graded. A pencil must be used on all tests. Otherwise, the test will not be graded.
- ❖ If you finish early, go over the test again.

Good luck!

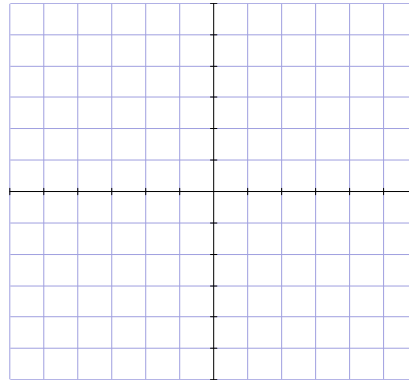
Number	Maximum	Score
1	6	
2	26	
3	10	
4	18	
5	12	
6	28	
Total	100	

Name \_\_\_\_\_

Be sure to shade feasible regions the darkest!

1) (6 points) Sketch the following system of linear inequalities. **Determine if the solution is bounded or unbounded.**

$$\begin{cases} 3x + 4y \leq 12 \\ x \leq 4 \\ y \geq -2 \end{cases}$$

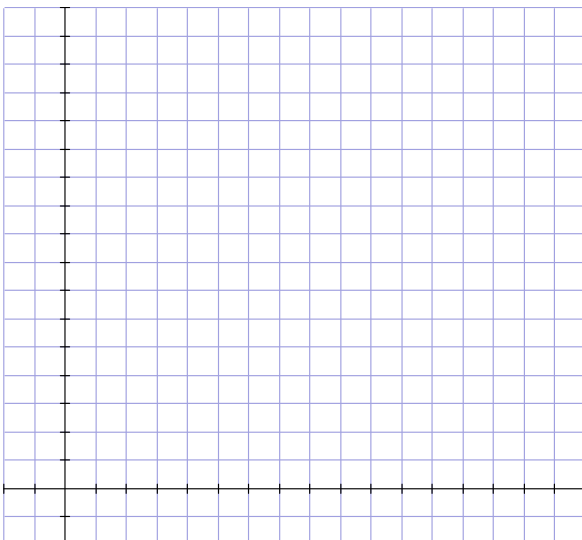


2) Solve the following Maximization LP using the corner point method:

In Karla's garden shop, she makes two kinds of mixtures for planting: gardening mixture and potting mixture. A package of gardening mixture requires 2 lb of soil, 1 lb of peat moss, and 1 lb of fertilizer. A package of potting mixture requires 1 lb of soil, 2 lb of peat moss, and 3 lb of fertilizer. She has at most 16 lb of soil, 11 lb of peat moss, and 15 lb of fertilizer. A package of garden mixture sells for \$3 and a package of potting mixture sells for \$5.

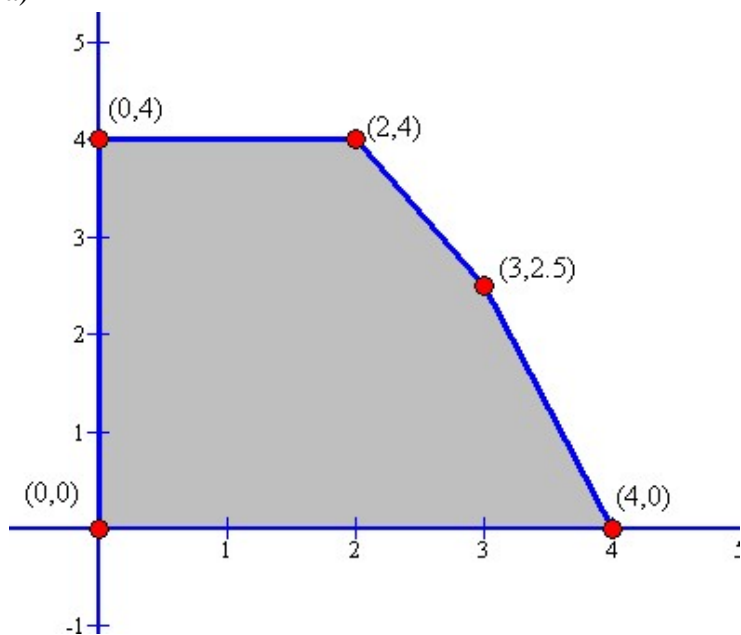
a) (8 points) Name and define variables. Write an objective function and all necessary constraints:

b) (18 points) Use the Corner Point Method to solve the LP. Interpret the optimal solution and optimal value using the language of the problem:



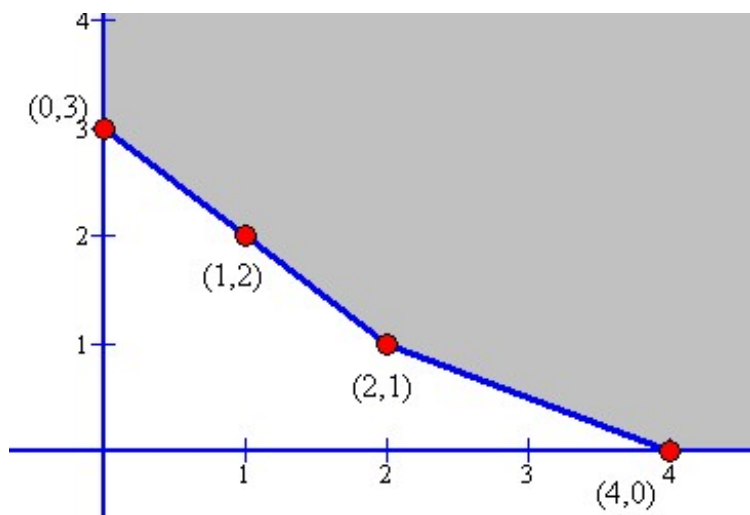
3) (5 points each) For the following feasible regions, find the maximum and minimum of the objective function  $z = 2x + 3y$  if they exist. **Be sure to label your answers as “maximum” and “minimum”.**

a)



$(x, y)$	$z = 2x + 3y$

b)



$(x, y)$	$z = 2x + 3y$

4) (3 points each) Consider a Maximization LP in standard form...

a) How is Pivot Column determined?

b) Based on your answer from part *a*, why is the Pivot Column picked this way?

c) Graphically, what does the Pivot Column tell you?

d) How is the Pivot Row determined?

e) Based on your answer to part *d*, why is the Pivot Row picked this way?

f) Graphically, what does the Pivot Row tell you?

5) (6 points each) The following tableaus need pivoting. Circle the pivot element or explain why there isn't one. **Do not actually pivot.** Also state what the current value of  $z$  is and the corresponding augmented coordinates:

a)

<i>BV</i>	$x_1$	$x_2$	$s_1$	$s_2$	$z$	<i>RHS</i>
$s_1$	1	3	1	0	0	100
$s_2$	4	2	0	1	0	500
$z$	-1	-2	0	0	1	0

b)

<i>BV</i>	$x_1$	$x_2$	$x_3$	$s_1$	$s_2$	$z$	<i>RHS</i>
$s_1$	1	0	-6	1	1	0	300
$x_2$	3	1	0	0	2	0	50
$z$	1	2	-5	0	8	1	0

6) For the following Minimization LP...

$$\text{Minimize } w = 16y_1 + 11y_2 + 15y_3$$

subject to

$$2y_1 + y_2 + y_3 \geq 3$$

$$y_1 + 2y_2 + 3y_3 \geq 5$$

$$y_1, y_2, y_3 \geq 0$$

a) (8 points) Write the dual Maximization LP:

b) (12 points) Use the Simplex Method on the LP found from part a:

c) (8 points) What is the optimal solution and optimal value of the Minimization LP?

Extra Credit: What is the optimal solution and optimal value of the Maximization LP?