MATH 1470 Fall 2021 Mike McCraith
Exam 4

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!

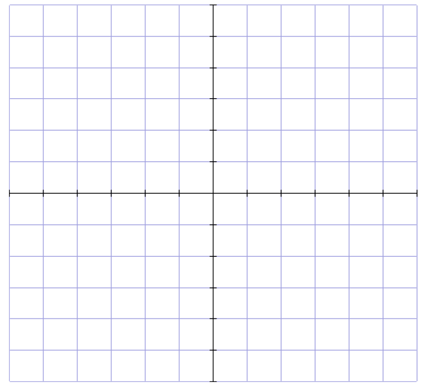
Number	Maximum	Score
1	6	
2	26	
3	10	
4	18	
5	12	
6	28	
Total	100	

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.**

$$\begin{cases} 3x+4y\le 12 \\ x\le 4 \\ y\ge -2 \end{cases}$$

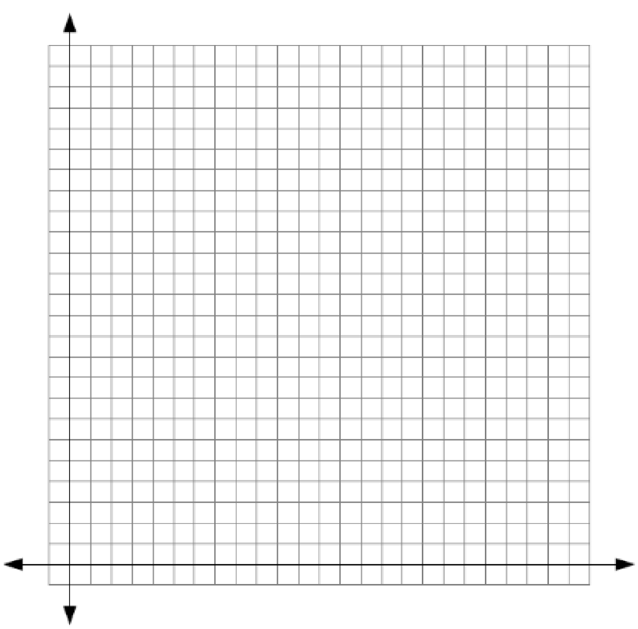


2) Solve the following Maximization LP using the corner point method:

In order to maximize viewers, the MNT network plans to broadcast a 12-hour marathon of two shows: *Gerbils of Doom* and *Let's Make a Donut*. The show *Gerbils* attracts 2.2 million viewers and runs for 60 minutes while *Donut* attracts 1.4 million viewers and runs for 30 minutes. Due to contract with both shows, they each need to appear at least 4 times during the marathon. How many times should each show be run to maximize the total number of viewers during the marathon? What is the maximum number of viewers during the marathon?

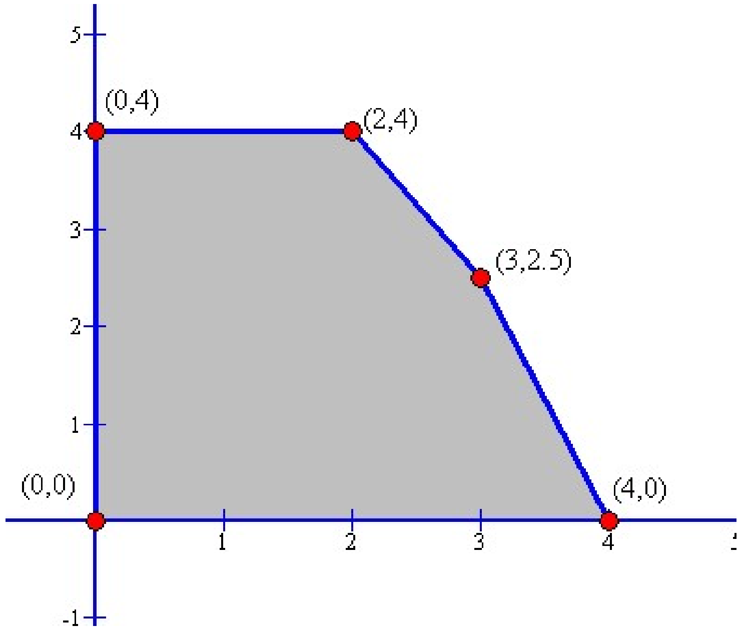
a) (8 points) Name and define variables. Write an objective function and all necessary constraints:

b) (18 points) Use the Corner Point Method to solve the LP. **Count the tick-marks by 2.** Interpret the optimal solution and optimal value using the language of the problem.



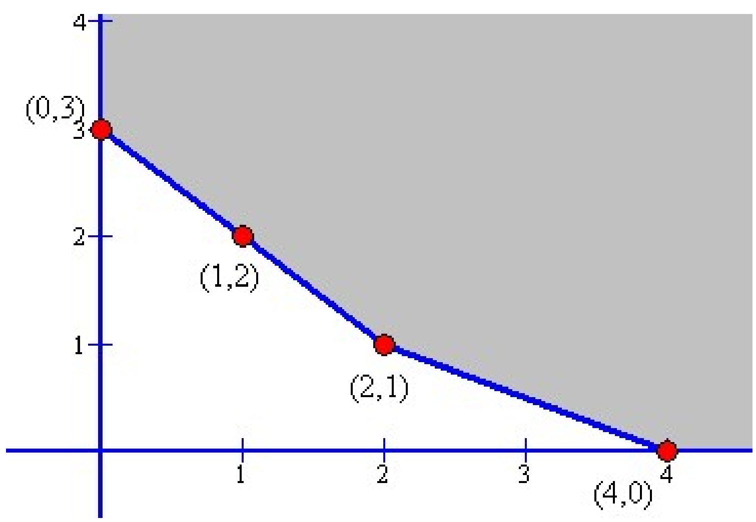
3) (5 points each) For the following feasible regions, find the maximum and minimum of the objective function $z = 5x + 3y$ if they exist. **Be sure to label your answers as "maximum" and minimum"**.

a)



(x, y)	$z = 5x + 3y$

b)



(x, y)	$z = 5x + 3y$

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)

BV	x_1	x_2	s_1	s_2	z	RHS
s_1	1	3	1	0	0	550
s_2	4	2	0	1	0	220
z	−1	−2	0	0	1	0

b)

BV	x_1	x_2	x_3	s_1	s_2	z	RHS
s_1	1	−6	0	1	1	0	600
x_3	3	0	1	0	2	0	250
z	1	−5	0	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?