MATH 1470 Fall 2019 — 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 6 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.
- If you finish early, go over the test again.

Good luck!

Number	Maximum	Score
1	12	
2	14	
3	12	
4	17	
5	12	
6	9	
7	24	
Total	100	

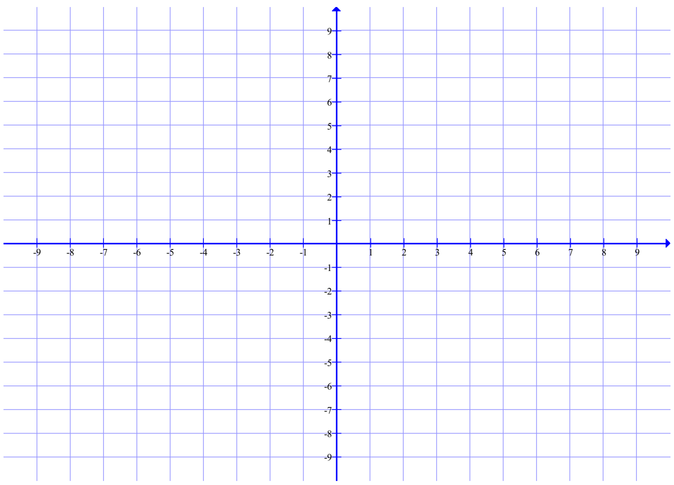
Name ________________________________

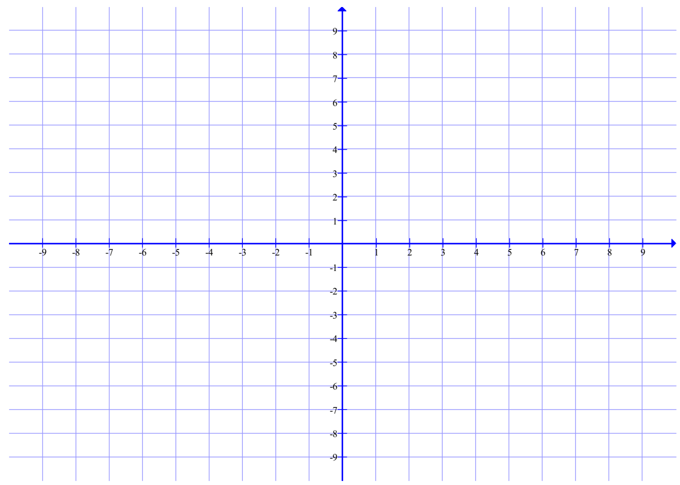
Circle Final Answers

1) (6 points each) For the following systems of equations, sketch the feasible region and determine if the feasible region is bounded or unbounded. Be sure to shade your answer in the darkest:

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

b) $\begin{cases} x + 4y \le 8 \\ 5x + 3y \le 15 \\ x \ge 0 \\ y \ge 0 \end{cases}$





2) (14 points) For the following linear programming problem:

i) Graph the feasible region and label the corner points. **Use fractions as needed.**

ii) Use the Corner Point Method to solve. Label the optimal solution and optimal value.

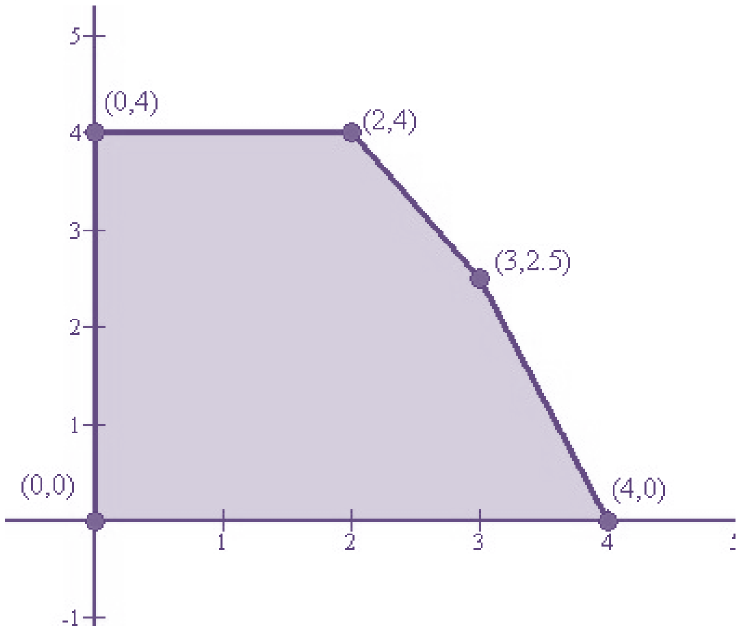
Minimize $z = 10x + 42y$

subject to

$$\begin{aligned} x + 7y &\ge 6 \\ 2x + 6y &\ge 7 \\ x &\ge 0 \\ y &\ge 0 \end{aligned}$$

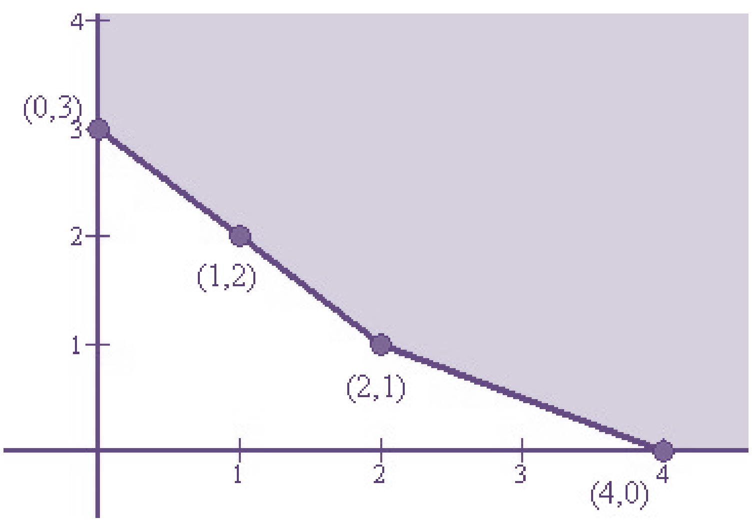
3) (6 points each) For the following feasible regions, find the maximum and minimum of the objective function $z = 2x + 7y$ if they exist. **Be sure to label your answers as "maximum" and minimum".**

a)



(x, y)	$z = 2x + 7y$

b)



(x, y)	$z = 2x + 7y$

4) For the following linear programming problem:

Dandy Candy makes and sells many types of candy bars. Their top three sellers are the Peanut Amazement, the Crunchy Yum, and the Sweet Tooth. Each Peanut Amazement needs 40 peanuts, ¼ cup of caramel, 1.5 hours to bake and sells for $3.50. Each Crunchy Yum needs 60 peanuts, ½ cup of caramel, 2 hours to bake and sells for $4.75. Each Sweet Tooth needs 15 peanuts, 2 cups of caramel, 1 hour to bake and sells for $2.75. If there are at most 500 peanuts, 20 cups of caramel, and 45 hours of baking time available, how many of each type of candy bar should be sold to maximize revenue?

a) (3 points) Name and define variables for this problem:

b) (6 points) Write the corresponding linear programming problem including all inequalities:

c) (4 points) Write the linear programming problem in equation form by introducing slack variables. **You do not have to define your slack variables.**

d) (4 points) Write the initial simplex tableau for this problem. **Do not solve.**

5) (2 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) What does the Pivot Column tell us geometrically?

d) How is the Pivot Row determined?

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

f) What does the Pivot Row tell us geometrically?

6) (9 points) For the tableau below:

i) Fill in the Basic Variable column.

ii) Write the corresponding point (x_1, x_2, s_1, s_2) and objective function value. Is it a corner point? Why or why not?

iii) Circle the pivot element.

iv) Declare what the new Basic Variable and Non-basic Variable will be *after* the pivot. **Do not actually pivot**

BV	x_1	x_2	s_1	s_2	z	RHS
	1	4	0	6	0	8
	0	6	1	5	0	10
z	0	-12	0	-6	1	27

Point corresponding to tableau: ________________________ Obj. function value: ________

7) For the following Minimization LP…

$$\begin{aligned} &\text{Minimize } w = 10y_1 + 42y_2 \\ &\text{subject to} \\ &y_1 + 7y_2 \ge 6 \\ &2y_1 + 6y_2 \ge 7 \\ &y_1 \ge 0 \\ &y_2 \ge 0 \end{aligned}$$

a) (6 points) Write the dual Maximization LP. Be sure to use the correct variables!

b) (15 points) Use the Simplex Method to solve the Max LP found from part *a*. Show all necessary work:

c) (3 points) What is the optimal solution and optimal value of the Minimization LP?