Department of Mathematics

Ma162 Chapter 3 Exam

July 2, 2010

DO NOT TURN THIS PAGE UNTIL INSTRUCTED TO DO SO.

Instructions: Be sure that your name, section number, and student ID are filled in below. Cell phones must be OFF and put away before you open this exam. You may use calculators (including graphing calculators, but no laptops or cellphone calculators) for checking numerical calculations, but you must show your work to receive credit. Put your answers in the answer boxes provided, and show your work. If your answer is not in the box or if you have no work to support your answer, you will receive no credit. The test has been carefully checked and its notation is consistent with the homework problems. No additional details will be provided during the exam.

Problem	Maximum	Actual
1	20	
2	20	
3	20	
4	20	
5	20	
Total	100	

Name: _____

Section: 020

Last four digits of Student ID: _____

1. Describe the variables, constraints, and objective of this word problem, but you need not solve it:

Paul T. is running for SG based on a platform of bribery and libations. To gain popular support, Paul is putting together two gift bags most simply described as the Cheap and the Tasty. The Cheap includes 2 packets of diet tea mix, 1 energy drink, 1 fun size candy bars, and 10 mints. The Tasty contains 2 packets of diet tea mix, 1 energy drinks, 5 fun size candy bars, and 2 mints. Paul's generous patrons have donated 200 packets of diet tea mix, 96 cans of energy drink, 200 fun size candy bars, and 800 mints, but he cannot include anything extra or he'll have gone over budget and be disqualified. Paul expects votes from about 10% of the people he gives the Cheap, and from about 40% of the people he gives the Tasty. How many bags of each type should Paul give away in order to maximize his support?
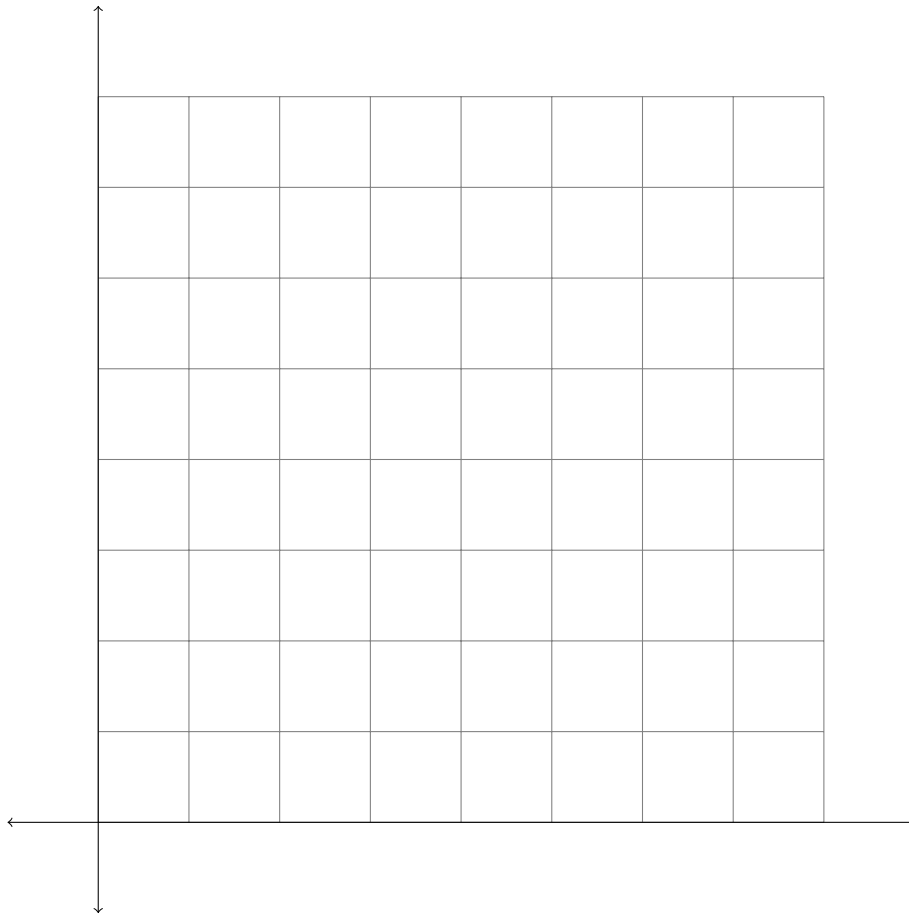
Variables:

Constraints:

Objective:

2. Graph the feasible region for the following constraints. You will be graded on three aspects: correctly drawn edges, correctly shaded region, and correctly labelled corners. List the corners and determine if the region is bounded or unbounded.

$$\begin{cases} x - 2y \geq -8 \\ 2x - y \leq 6 \\ x + y \leq 6 \\ x, \ y \geq 0 \end{cases}$$

Corners:

Is the region bounded or unbounded?

3. A Jumble Juice uses both juice concentrate and freshly squeezed juice to make its most popular drink, but alters the amount of juice concentrate and fresh juice based on various factors. Maintaining the flavor and nutritional information requires carefully staying within the feasible region, but the choice of the best mix depends on the season: in February fresh juice is quite expensive and cuts into the profit, but in June real juice is relatively cheap and more people have seconds when they taste the fresh juice, so the overall profits are higher when using real fruit juice. Use x to mean the number of ounces of juice concentrate to put in the drink, and use y to mean the number of ounces of fresh juice to put in the drink.

Find the location of the maximum value of the following objective functions on the feasible region graphed to the right:

$$\begin{cases} P_{Feb} = 6x + 5y \text{ cents per oz.} \\ P_{Apr} = 5x + 6y \text{ cents per oz.} \\ P_{Jun} = 4x + 7y \text{ cents per oz.} \end{cases}$$
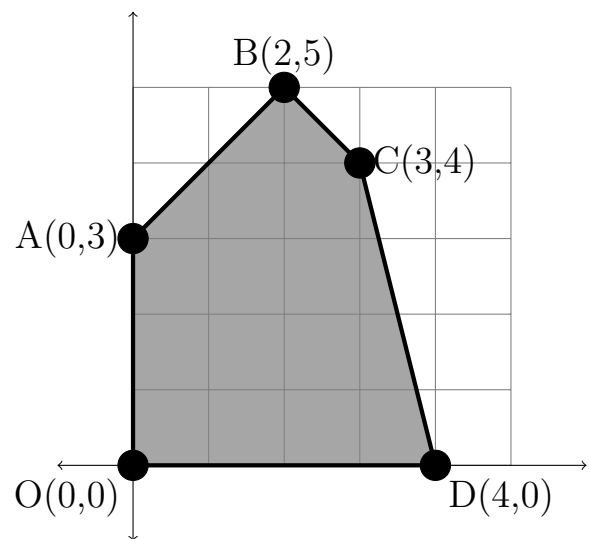
Maximums and the maximizing mixture:

Feb:

Apr:

Jun:

4. (Refer to problem #1) Paul's top advisor, Gesse McGee, suggests that Paul produce 76 Cheap bags, and 20 Tasty bags. How much extra was left over of each type: diet tea mix, energy drinks, fun size candy bars, and mints? About how many votes will this strategy yield? (Decimals are fine, as these are just probabilities)
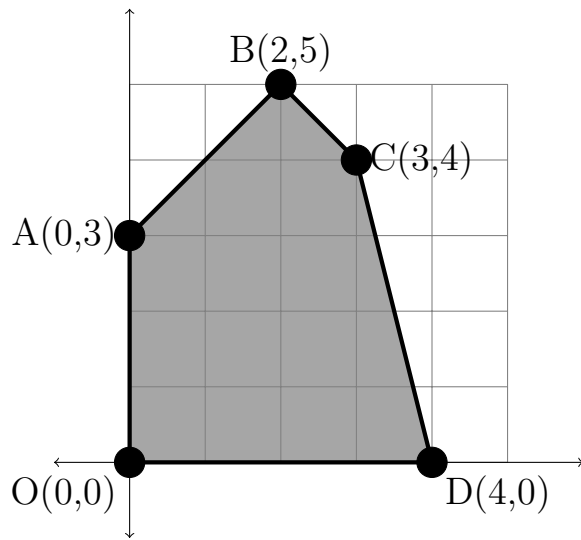
Can you do better?

Surplus:

Votes:

Recommendation, resulting surplus, and votes:

5. Give the inequalities defining the region below:

Inequalities:

OA:

AB:

BC:

CD:

DO:

Extra graph paper: