DEPARTMENT OF MATHEMATICS

Ma 162 Second Exam March 3, 2008

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

Instructions: Be sure 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 cacluators) 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 Score	Actual Score
1	18	
2	16	
3	16	
4	16	
5	18	
6	16	
Total	100	

Please fill in the information below.

NAME: _____ **Section:** _____
Last four digits of Student ID: _____

1. Consider the following Matrices and answer the questions.

   In each case, either calculate the expression or explain why it is not defined.

$$A = \begin{bmatrix} -3 & 2 & 3 \\ -4 & -4 & 3 \\ 2 & 2 & 5 \end{bmatrix} \quad B = \begin{bmatrix} -3 & -5 & 2 \\ 0 & 3 & 5 \end{bmatrix} \quad C = \begin{bmatrix} 1 & 1 \\ 5 & -4 \\ 0 & -5 \end{bmatrix} \quad D = \begin{bmatrix} 2 & -4 \\ -4 & 0 \end{bmatrix}$$

   (a) $D^2 - 2\,D$

   Answer:

   (b) AB

   Answer:

   (c) BC

   Answer:

   (d) $2\,A + 5\,C$

   Answer:

   (e) CD

   Answer:

2. (a) Find the inverse of the matrix $A = \begin{bmatrix} 5 & 3 \\ 1 & 3 \end{bmatrix}$.

Answer:

(b) Find the inverse of the matrix $B = \begin{bmatrix} 3 & 0 & -1 \\ 3 & 1 & 0 \\ -2 & 0 & 1 \end{bmatrix}$.

Answer:

3. Set this problem up, by stating the chosen variables, the function to be maximized and **all** the inequalities. **Do not solve the problem.**

   The juice company "Exotics" has three lines of juice mixes.

   Each carton of blend A contains 10 ounces of Peach concentrate and 6 ounces of Mango paste.

   Each carton of blend B contains 9 ounces of Peach concentrate and 7 ounces of Orange concentrate.

   Each carton of blend C contains 7 ounces of Peach concentrate, 5 ounces of Orange concentrate and 4 ounces of Mango paste.

   The company has 9000 ounces of Peach concentrate, 6000 ounces of Orange concentrate and 12000 ounces of Mango paste in stock.

   If the profits per carton of the blends A, B, C are $1.20, 1.50, 1.50$ dollars respectively, how many cartons of each blend should be produced?

Define each variable here:

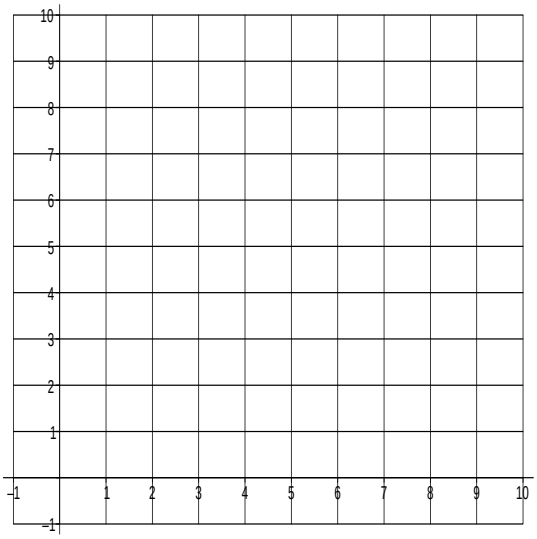
Maximize: Profit $P =$ Subject to:

4. i) Sketch and shade the region described by the inequalities. Compute the coordinates of the corner points and mark them on your graph.

$0 \leq x$, $0 \leq y$

$6 \leq x + y$

$10 \leq x + 2\,y$



ii) Find the minimum value of the function, $C = 6\,x + 10\,y$ on the region.

Answer: $P =$ ☐ at $x =$ ☐ ,$y =$ ☐ .

5. Here is an intermediate tableau associated with a maximal LPP.

x	y	z	s	t	P	constants
2	3	0	1	0	0	14
-1	1	1	0	-2	0	4
6	-5	0	0	15	1	12

i) Circle the pivot element and carry out the next iteration of the simplex method.

ii) Using your answer in the first part, report the solution to the original maximal LPP.

Value of P= ☐ (x , y , z)=(☐ , ☐ , ☐)

6. You are given the minimization problem:

Minimize the objective function: $C = 10\,x + 3\,y + 10\,z$

Subject to:

$$20 \leq 2\,x + y + 5\,z$$

$$30 \leq 4\,x + y + z$$

$x \geq 0, y \geq 0$ and $z \geq 0$

The final tableau **for the dual problem** is:

u	v	x	y	z	P	constants
0	0	2	-9	1	0	3
0	1	1/2	-1	0	0	2
1	0	$-1/2$	2	0	0	1
0	0	5	10	0	1	80

Using this give the solution to the primal problem (i.e. original minimal LPP):

Value of C= [ ] The point: (x , y , z)=([ ] , [ ] , [ ])

1 Answer Key for exam2_v1

1. ◇ (a) $\begin{bmatrix} 16 & 0 \\ 0 & 16 \end{bmatrix}$ (b) DNE (c) $\begin{bmatrix} -28 & 7 \\ 15 & -37 \end{bmatrix}$ (d) DNE (e) $\begin{bmatrix} -2 & -4 \\ 26 & -20 \\ 20 & 0 \end{bmatrix}$

2. ◇ (a) $\begin{bmatrix} 1/4 & -1/4 \\ -1/12 & \frac{5}{12} \end{bmatrix}$ (b) $\begin{bmatrix} 1 & 0 & 1 \\ -3 & 1 & -3 \\ 2 & 0 & 3 \end{bmatrix}$

3. ◇
$$P = 1.2\,x + 1.5\,y + 1.5\,z$$
$$0 \le x\ ,\ 0 \le y$$
$$10\,x + 9\,y + 7\,z \le 9000$$
$$7\,y + 5\,z \le 6000$$
$$6\,x + 4\,z \le 12000$$

4. ◇ $P = 52$ at $x = 2$ $y = 4$.

5. ◇ P= 32 (x,y,z) $[0, 4, 0]$

6. ◇ P= 80 (x,y,z) $[5, 10, 0]$