

DEPARTMENT OF MATHEMATICS

Ma 162 Second Exam March 8, 2010

DO NOT TURN THIS PAGE UNTIL YOU ARE 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. 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.

$$P = \begin{bmatrix} -1 & -2 & -5 \\ 5 & -3 & 1 \\ 5 & 5 & 1 \end{bmatrix} \quad Q = \begin{bmatrix} 0 & -2 & -2 \\ -5 & -2 & 1 \end{bmatrix} \quad L = \begin{bmatrix} 0 & 3 \\ 4 & -5 \\ -1 & -1 \end{bmatrix} \quad M = \begin{bmatrix} 3 & -3 \\ 4 & -3 \end{bmatrix}$$

- (a) M^2

Answer:

- (b) LP

Answer:

- (c) QP

Answer:

- (d) MQ

Answer:

- (e) $11Q - 5L$

Answer:

2. (a) Clearly state the used formula or show your work.

Find the inverse of the matrix $A = \begin{bmatrix} 1 & -5 \\ -4 & 3 \end{bmatrix}$.

Answer:

- (b) Use your calculator or usual algorithm to find the inverse of the matrix

$P = \begin{bmatrix} 1 & 0 & 0 \\ 1 & 1 & 0 \\ 0 & -3 & 1 \end{bmatrix}$.

Answer:

(c) Suppose that $A^{-1} = \begin{bmatrix} -5 & 3 & -1 \\ -3 & 1 & 0 \\ 6 & -3 & 1 \end{bmatrix}$

and $B = \begin{bmatrix} -3 \\ 1 \\ -3 \end{bmatrix}$.

Determine the solution X of the equation $AX = B$.

Answer:

3. Penny manages an investment fund of 400000 dollars and wants to invest them into Junk bonds and Municipal bonds.

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

Junk bonds pay 9% and Municipal bonds pay 6%. Penny's firm requires that she invest **at least** 4 times as much in Municipal bonds as in the Junk bonds in order to manage risk.

Write, but do not solve a linear program whose solution will produce the amounts to be invested in the Junk bonds and the Municipal bonds in order to maximize return while managing risk.

Define each variable here:

Maximize: Return $P =$

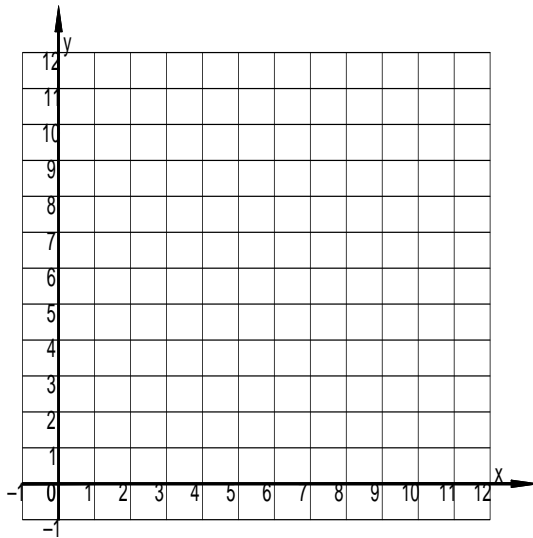
Subject to:

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

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

$$x + y \leq 5.5$$

$$x + 3.5y \leq 10.5$$



- ii) Find the maximum value of the function, $P = x + 7.0y$ on the region.

Answer: $P = \boxed{}$ at $x = \boxed{}$, $y = \boxed{}$.

5. Here is an intermediate tableau associated with a maximal Linear Programming Problem(LPP).

x	y	z	s	t	P	constants
0	1	-3	1	-2	0	5
1	1	2	0	1	0	9
0	-1	24	0	4	1	48

- 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: $C = 15x + 3y + 10z$

Subject to:

$$10 \leq 2x + y + 5z$$

$$7 \leq 4x + y + z$$

$$x \geq 0, y \geq 0 \text{ and } z \geq 0$$

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

u	v	x	y	z	P	constants
0	0	1	$-9/2$	$1/2$	0	$13/2$
0	1	0	$5/4$	$-1/4$	0	$5/4$
1	0	0	$-1/4$	$1/4$	0	$7/4$
0	0	0	$\frac{25}{4}$	$3/4$	1	$\frac{105}{4}$

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 exam2v-5

1. \diamond (a) $\begin{bmatrix} -3 & 0 \\ 0 & -3 \end{bmatrix}$ (b) DNE (c) $\begin{bmatrix} -20 & -4 & -4 \\ 0 & 21 & 24 \end{bmatrix}$ (d) $\begin{bmatrix} 15 & 0 & -9 \\ 15 & -2 & -11 \end{bmatrix}$ (e) DNE

2. \diamond (a) $\begin{bmatrix} -\frac{3}{17} & -\frac{5}{17} \\ -\frac{4}{17} & -1/17 \end{bmatrix}$ (b) $\begin{bmatrix} 1 & 0 & 0 \\ -1 & 1 & 0 \\ -3 & 3 & 1 \end{bmatrix}$ (c) $\begin{bmatrix} 21 \\ 10 \\ -24 \end{bmatrix}$

3. \diamond
$$P = \frac{9}{100}x + \frac{3}{50}y$$

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

$$x + y = 400000$$

$$4x \leq y$$

4. \diamond $P = 21.0$ at $x = 0$ $y = 3.0$. $[[0, 0], [5.5, 0], [3.5, 2], [0, 3.0]]$

5.

\diamond (i) Pivot in [1,2] position

	0	1	-3	1	-2	0	5	
	1	0	5	-1	3	0	4	(ii) P= 53 (x,y,z) [4, 5, 0]
	0	0	21	1	2	1	53	

6. \diamond P= $\frac{105}{4}$ (x,y,z) $[0, \frac{25}{4}, 3/4]$