Math 166
Name _________________________
Spring 2004
ID Number _____________________
Exam 1
Section _________   Seat _________
VERSION A

I hereby state that the work on this exam is my own _______________________________________
   (signature required)

Read all directions.
PUT YOUR NAME, SECTION NUMBER AND VERSION A ON YOUR SCANTRON.
The scantrons will not be returned, so mark your answers on this exam too.
Write neatly.
If you need scratch paper, ask for it. DO NOT use your own scratch paper.
No partial credit on scantron questions.
There are 3 pages. The back of the cover page is blank.
There is a 5 point deduction for any errors in following the directions. This includes errors in your name, ID number, section number, missing signature and no version color or name on your scantron.
There will be a deduction of 5 points for any hand grading of your scantron.

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<table>
<thead>
<tr>
<th>Part</th>
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</thead>
<tbody>
<tr>
<td>Part I</td>
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<td>Part II</td>
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</tr>
<tr>
<td>Part III</td>
<td>/56</td>
</tr>
<tr>
<td>TOTAL</td>
<td>/100</td>
</tr>
</tbody>
</table>
EXAM PART I – Four Point Multiple Choice Questions: Answer these question on the FRONT of your scantron.

1. The table shows x, the number of muffins supplied at a bakery at different prices, y, in dollars. Using linear regression, determine the lowest price the bakery is willing to accept for muffins.

<table>
<thead>
<tr>
<th>x</th>
<th>12</th>
<th>25</th>
<th>36</th>
<th>47</th>
<th>59</th>
</tr>
</thead>
<tbody>
<tr>
<td>y</td>
<td>1.00</td>
<td>1.50</td>
<td>1.80</td>
<td>2.05</td>
<td>2.30</td>
</tr>
</tbody>
</table>

(A) $0.03 (B) $0.26 (C) $0.36 (D) $0.75 (E) none of the above

2. Matrix F shows the number of units of different building materials needed for the exterior of three different model homes. The builder is planning on building 31 model A homes, 26 model B homes and 15 model C homes. Find a matrix G such that when it is multiplied by F will give the total amount of each exterior material needed by the builder.

\[
F = \begin{pmatrix}
11 & 3 & 9 \\
5 & 9 & 11 \\
14 & 2 & 17 \\
\end{pmatrix}
\]

\[
G = \begin{pmatrix}
31 & 26 & 15 \\
31 & 26 & 15 \\
26 & 26 & 15 \\
\end{pmatrix}
\]

(A) \( H = FG \), with \( G \) 31 26 15 (B) \( H = GF \), with \( G \) 31 31 (C) \( H = FG \), with \( G \) 26 26 (D) \( H = GF \), with \( G \) 31 15 (E) none of the above

3. Matrix \( M \) shows the number of different photo albums in stock at a store at the beginning of March. No new shipments arrive and matrix \( N \) shows the number of photo albums in stock at this same store at the end of the month. The store tracks three sizes of albums (small, medium and large) and three different cover styles (smiley, wedding and baby). Matrix \( P \) shows the price of each size album. What does the matrix \( Q = (M - N)P \) mean?

\[
M = \begin{pmatrix}
13 & 8 & 4 \\
6 & 14 & 25 \\
12 & 15 & 9 \\
\end{pmatrix}
\]

\[
N = \begin{pmatrix}
3 & 2 & 1 \\
2 & 4 & 5 \\
2 & 5 & 1 \\
\end{pmatrix}
\]

\[
P = \begin{pmatrix}
7 & 12 & 25 \\
12 & 1 & 12 \\
25 & 7 & 25 \\
\end{pmatrix}
\]

(A) The number of each style of album sold in March. (B) The number of each size of album sold in March. (C) The revenue from each style of album sold in March. (D) The revenue from each size of album sold in March. (E) none of the above

4. Solve the following matrix equation for \( X \): \( XA + XB = C \)

(A) can’t be solved (B) \( \frac{C}{A - B} \) (C) \( (A - B)^{-1}C \) (D) \( C(A - B)^{-1} \) (E) none of the above

5. A store finds that it can sell 24 packages of collectible cards per day if the price is $5 per package. If the price is decreased by $1, the store will sell an additional 8 packages per day. Find the demand equation for these collectible cards and use it to determine the price the store should charge for a package of these collectible cards if the store wants to sell 50 packages per day.

(A) $8.00 (B) $2.50 (C) $1.75 (D) $0.13 (E) none of the above

6. What is the equation of the vertical line that passes through the point \( (a, b) \)?

(A) \( x = a \) (B) \( x = b \) (C) \( y = a \) (D) \( y = b \) (E) none of the above
EXAM PART II – Two Point Multiple Choice Questions. Answer questions 51 – 59 on the BACK of your scantron.

Questions 51 - 56: You are given information about the following matrices: E is 3x4, F is 4x3, G is 3x3, H is 4x4 (non-singular), I is 4x4 (identity matrix), J is 4x4 (singular). Check the following statements and choose the answer below the best fits each statement:

(A) Not possible (B) a 3x3 matrix (C) a 3x4 matrix (D) a 4x4 matrix (E) a 4x3 matrix

51. \( E \times F \) 52. \( I + H^{-1} = G \) 53. \( E \times H \) 54. \( I \times J \) 55. \( E + F^T \) 56. \( J^{-1} \)

Questions 57 - 60: Choose ALL correct responses for the given graph

(A) Supply function (B) Demand function (C) Profit function (D) Revenue function (E) none of these

57. Graph I above could be a _____

58. Graph VI above could be a _____

59. Graph II above could be a _____

60. Graph IV above could be a _____

EXAM PART III –Free Response Questions

Question 1 (4 points) Find the values of \( w, x, y \) and \( z \) in the matrix equation:

\[
\begin{bmatrix}
2 & 7 & 4 & 1 \\
3 & 5 & 0 & 1 \\
1 & 1 & 0 & 5 \\
\end{bmatrix}
\begin{bmatrix}
w \\
x \\
y \\
z \\
\end{bmatrix}
\]

\( w = \quad x = \quad y = \quad z = \quad \)

Question 2 (10 points) Using the graph below, find the exact value of the ALL corner points and CIRCLE the correct inequality symbols. The feasible region is in white.

Corners are at:

<table>
<thead>
<tr>
<th>x</th>
<th>4y</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>3x</td>
<td>28</td>
<td>47</td>
</tr>
<tr>
<td>x</td>
<td>3y</td>
<td>3</td>
</tr>
</tbody>
</table>
Question 3 (8 points)
A company purchases a high speed color laser printer for $12,000. It is depreciated linearly for 4 years and then sold for $2,000. What is the rate of depreciation? Find and graph the depreciation equation.

Question 4 (4 points) What is the solution to the linear system shown in the augmented matrix?

\[
\begin{bmatrix}
1 & 0 & 0 & | & 5 \\
0 & 0 & 1 & | & 1 \\
0 & 0 & 0 & | & 0
\end{bmatrix}
\]

Question 5 (7 points) Set up, but do not solve, the following problem:
A dietician wishes to design a meal for Sandy that will have her minimum daily requirements of iron, calcium and folic acid. The dietician will use Foods I, II and III to make this meal. The table below shows how many units of each nutrient is found in each ounce of the foods. If Sandy needs 51 units of iron, 540 units of calcium and 128 units of folic acid, how much of each food should she have in her meal?

<table>
<thead>
<tr>
<th></th>
<th>Iron</th>
<th>Calcium</th>
<th>Folic Acid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food I</td>
<td>5</td>
<td>20</td>
<td>8</td>
</tr>
<tr>
<td>Food II</td>
<td>1</td>
<td>60</td>
<td>4</td>
</tr>
<tr>
<td>Food III</td>
<td>3</td>
<td>40</td>
<td>10</td>
</tr>
</tbody>
</table>
Question 6 (7 points) Find the solution to the following problem:

An investor has $2000 to invest in his IRA this year. His broker suggests investing in \( x \) dollars in bonds, \( y \) dollars in stocks and \( z \) dollars in gold. To balance his portfolio, the broker suggests he has three times as much money in stocks as in gold. The investor then has to decide how much to invest in each option. The equations for this problem are \( x + y + z = 2000 \) and \( y = 3z \). How much can the investor put into each of these options?

Question 7 (5 points) A company makes and sells Aggie gift baskets. The company finds that the baskets cost an average of $40 each to make when they make 10 baskets. If they make 50 baskets then the average cost to make a basket is $25 each. Find the total cost for the company to make 100 baskets.

Question 7 (6 points) A distributor has portable TV’s to supply to the market according to the equation \(-8x + 3p = 2500\) where \( p \) is the price in krona and \( x \) is the number of TV’s supplied in thousands. The consumers are willing to buy these portable TV’s according to the equation \( 9x + 2p = 3300 \). Find and interpret the equilibrium point for these portable TV’s. (round to the nearest krona)

Question 8 (5 points) Pivot on element \( a_{22} \) in matrix \( A \) 
\[
\begin{pmatrix}
6 & 4 & 12 \\
9 & 3 & 54 \\
\end{pmatrix}
\]
Show your work.