Math 141

Exam 1   VERSION A

September 26, 1997

Name _____

Roster Number _____

Section _____ SEAT _____

M.C.	
1	
2	
TOTAL	

The work on this exam is my own _____

<div align="right">(signature required)</div>

Please read all directions.

Be sure any written work to be read by me is legible.

There are 3 pages with writing on both sides of every page.

When you are done, put your exam and scantron in your envelope.

There is a five point deduction for any error in your name, roster number, section number, version letter (on your scantron) or missing signature. There is a 10 point deduction if I have to grade the scantron by hand.

PUT YOUR NAME AND VERSION LETTER (A) ON YOUR SCANTRON! There are 17 multiple choice questions to answer on your scantron. There is no partial credit on this part. The scantrons will not be returned, so please mark you answers on the exam too.

1. What is the y-intercept of the line passing through the point (2,-1) with a slope of 3?

(A) (0,-5)　　　　　(B) (5/3,0)　　　　　(C) (0,-7)　　　　　(D) (7/3,0)　　　　　(E) none of the above

2. At a price of \$45, 20 purses can be sold. At a price of \$30 we can sell 50 purses. Find the demand equation for the sale of these purses, $D(x) =$

(A) $-.5x + 55$　　　(B) $-2x + 110$　　　(C) .5x+35　　　(D) 2x-70　　　(E) none of the above

Questions 3 and 4 use the following information: A company makes bumper stickers. The fixed costs are \$600 and the bumper stickers cost 50 cents each to make. The stickers sell for \$2.00 each.

3. What is the cost equation for the production of bumper stickers? $C(x) =$

(A) $600 + 50x$　　　(B) $600 + .50x$　　　(C) $600 + 2.00x$　　　(D) $2.00x$　　　(E) none of the above

4. What is the break-even quantity for the bumper sticker company?

(A) 1200　　　　　(B) 800　　　　　(C) 300　　　　　(D) 400　　　　　(E) none of the above

Questions 5 and 6 use the data in the following table. Use the least squares line from the data in the table to *estimate* the values asked for in each question.

Math SAT score (x)	580	510	600	470	550
First test (y)	98	55	89	62	70

5. Predict the first test score of a person who received a 540 on the SAT.

(A) 72　　　　　(B) 73　　　　　(C) 74　　　　　(D) 75　　　　　(E) none of the above

6. Estimate the SAT score of a person who received 48 on the first test.

(A) 440　　　　　(B) 450　　　　　(C) 460　　　　　(D) 470　　　　　(E) none of the above

7. Find the value of k which makes the system below have no solution:

$$\begin{array}{rrrcr} 3x & - & y & = & 4 \\ -6x & + & ky & = & 10 \end{array}$$

(A) -2　　　　　(B) 0　　　　　(C) 1　　　　　(D) 2　　　　　(E) not possible

8. The Aggie farm wants to plant maroon carrots and sweet onions. There are 100 acres available for planting this fall. The number of acres of carrots is to exceed twice the acres of onions by 10. If they want to use all the land available, which of the equations below will be needed to decide how much of each kind of vegetable to plant? x is number of acres of carrots and y is the number of acres of onions. x is acres of carrots and y is acres of onions.

(A) $x = 2y + 10$ (B) $2x = y + 10$ (C) $x + 10 = 2y$ (D) $2x + 10 = y$ (E) none of the above

9. Find x and y. Answer is in (x, y) form. $2 \begin{bmatrix} x \\ -1 \end{bmatrix} - \begin{bmatrix} 1 \\ 2 \end{bmatrix} = \begin{bmatrix} 11 \\ y \end{bmatrix}$

(A) (10,1)   (B) (10,-4)   (C) (6,1)   (D) (6,-4)   (E) none of the above

10. A chain owns 3 restaurants (I, II and III) in the area and each serves breakfast (B), lunch (L) and dinner (D). The average number of meals served in a day is shown in matrix A. The average price for a breakfast is \$3, the average price of lunch is \$6 and the average price for dinner is \$10. Write a matrix B such that when it is multiplied by matrix A it will give a matrix R with the average revenue for each restaurant for the whole day.

$$\begin{array}{cccc} & restaurant\ I & restaurant\ II & restaurant\ III \\ A = \begin{array}{c} B \\ L \\ D \end{array} \left[\begin{array}{ccc} 66 & 300 & 250 \\ 150 & 200 & 400 \\ 50 & 600 & 220 \end{array}\right] \end{array}$$

(A) $B = \begin{bmatrix} 3 & 6 & 10 \end{bmatrix}, R = AB$ (B) $B = \begin{bmatrix} 3 & 6 & 10 \end{bmatrix}, R = BA$ (C) $B = \begin{bmatrix} 3 \\ 6 \\ 10 \end{bmatrix}, R = AB$

(D) $B = \begin{bmatrix} 3 \\ 6 \\ 10 \end{bmatrix}, R = BA$ (E) Not possible

11. What is the linear system corresponding to $AX = B$ if

$$A = \begin{bmatrix} 1 & 3 \\ 2 & -1 \end{bmatrix} \qquad X = \begin{bmatrix} x \\ y \end{bmatrix} \qquad B = \begin{bmatrix} 4 \\ 0 \end{bmatrix}$$

(A) $\begin{aligned} x &= 4 \\ y &= 0 \end{aligned}$ (B) $\begin{aligned} x &= 3 \\ 2y &= -1 \end{aligned}$ (C) $\begin{aligned} x + 3y &= 4 \\ 2x - y &= 0 \end{aligned}$ (D) $\begin{aligned} x + 2y &= 4 \\ 3x - y &= 0 \end{aligned}$

(E) none of the above

12. We are given approximately how many grams of fat, carbohydrate and protein in a "unit" each of the four food groups in matrix X (I is meat, II is fruits and vegetables, III is grains and IV is dairy). The number of calories per gram there are in fat, carbohydrates and protein is given in matrix Y. Explain what the entries in matrix XY represent.

$$Y = \begin{matrix} fat \\ carbohydrate \\ protein \end{matrix} \overset{calories}{\begin{bmatrix} 8 \\ 4 \\ 5 \end{bmatrix}} \qquad X = \begin{matrix} I \\ II \\ III \\ IV \end{matrix} \overset{\begin{matrix} fat & carbohydrates & protein \end{matrix}}{\begin{bmatrix} 5 & 0 & 7 \\ 0 & 10 & 1 \\ 0 & 15 & 2 \\ 10 & 12 & 8 \end{bmatrix}}$$

(A) number of calories in fat, carbohydrates and protein

(B) total amount of fat, carbohydrates and proteins in each food group

(C) number of calories in each food group

(D) total amount of food in each calorie group.

(E) None of the above

13. A person has \$10,100 to invest in two different stocks. Stock ABC costs \$32 per share and pays dividends of \$1.20 per share. Stock XYZ costs \$23 per share and pays dividends of \$1.40 per share. If she wants to earn a total of \$540 in dividends, how much should she invest in each stock?

(A) $\begin{matrix} \$100 \ in \ ABC \\ \$300 \ in \ XYZ \end{matrix}$ (B) $\begin{matrix} \$300 \ in \ ABC \\ \$100 \ in \ XYZ \end{matrix}$ (C) $\begin{matrix} \$5050 \ in \ ABC \\ \$5050 \ in \ XYZ \end{matrix}$ (D) $\begin{matrix} \$3200 \ in \ ABC \\ \$6900 \ in \ XYZ \end{matrix}$ (E) $\begin{matrix} \$9600 \ in \ ABC \\ \$2300 \ in \ XYZ \end{matrix}$

14. Is matrix A in row reduced form? $A = \begin{bmatrix} 0 & 1 & | & a \\ 0 & 0 & | & b \end{bmatrix}$

(A) YES   (B) yes, if $a = 0$ (C) yes, if $a \neq 0$ (D) yes, if $b = 0$ (E) NO

15. Solve the system $\begin{matrix} 4x + 6y & = 1 \\ 2x + 3y & = 2 \end{matrix}$ and express your answer in (x, y) form.

(A) (x, y) (B) (0,1)   (C) $(-1.5y, y)$ (D) no solution   (E) none of the above

16. Solve the system $\begin{matrix} 2x & + & 3y & + & z & = & 1 \\ x & + & y & + & z & = & 3 \\ 3x & + & 4y & + & 2z & = & 4 \end{matrix}$ and express your answer in $(x, y, z) form.$

(A) (8,-5,z)   (B) $(8 - 2z, z - 5, z)$ (C) (8,-5,0)   (D) no solution

(E) none of the above

17. Given matrix A, what would be the next step in Gauss-Jordan?

$$A = \begin{bmatrix} 1 & -1 & 0 & | & 6 \\ 0 & 1 & 1 & | & 4 \\ 0 & 0 & 3 & | & 5 \end{bmatrix}$$

(A) Gauss-Jordan is done - write out the equations

(B) Make element $a_{21} = 0$ by adding row 2 to row 1

(C) Make element $a_{21} = 0$ by mulitplying by row 1 by 0

(D) Make element $a_{12} = 0$ by adding row 2 to row 1

(E) Make element $a_{12} = 0$ by mulitplying row 1 by 0

WORK OUT PROBLEMS - be sure to show you work to get full credit

1. (5 points) Formulate, but do not solve the system of linear inequalities for the problem below:

A bakery makes both cakes and cookies. Each batch of cakes requires 2 hours in the oven and 3 hours in the decorating room. Each batch of cookies requires 1.5 hours in the oven and .75 hour in the decorating room. The oven is available no more than 15 hours per day and the decorating room is available up to 13 hours per day. The batch of cakes will sell for $50 and the batch of cookies for $35. How many batches of each should be made each day to maximize revenue?

2. (10 points) Graph the system of linear inequalities. Indicate the feasible region by shading or reverse shading. Label all corners of the feasible region exactly.

$$
\begin{array}{rcl}
3x - 2y & \leq & 12 \\
x + y & \leq & 6 \\
x & \geq & 2 \\
y & \geq & 0
\end{array}
$$