Math 106 Fall 2008 Name_____
Quiz 2 Chapters 2 & 3 Each problem worth 5 points. Number 21 is extra credit.

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) The result of performing the elementary row operation [3] + (5) [2] on the system $\left[\begin{array}{ccc|c} 1 & 0 & 3 & 9 \\ 0 & 1 & -3 & 2 \\ 0 & -5 & 4 & 1 \end{array}\right]$ is

A) $\left[\begin{array}{ccc|c} 1 & 0 & 3 & 9 \\ 0 & 1 & -3 & 2 \\ 10 & 5 & 14 & 11 \end{array}\right]$.

B) $\left[\begin{array}{ccc|c} 1 & 0 & 3 & 9 \\ 0 & 1 & -3 & 2 \\ 0 & 0 & -11 & 11 \end{array}\right]$.

C) $\left[\begin{array}{ccc|c} 1 & 0 & 3 & 9 \\ 0 & 0 & -3 & 2 \\ 0 & -5 & 4 & 1 \end{array}\right]$.

D) $\left[\begin{array}{ccc|c} 1 & 0 & 3 & 9 \\ 0 & -5 & -11 & 11 \\ 0 & -5 & 4 & 1 \end{array}\right]$.

2) The system $\left[\begin{array}{ccc|c} 1 & 0 & 0 & -2 \\ 0 & 1 & 3 & 5 \\ 1 & 1 & -3 & 4 \end{array}\right]$ is equivalent to the system

A) $\left[\begin{array}{ccc|c} 1 & 0 & 0 & -2 \\ 0 & 1 & 3 & 5 \\ 0 & 1 & -3 & 6 \end{array}\right]$.

B) $\left[\begin{array}{ccc|c} 1 & 0 & 0 & -2 \\ 0 & 3 & -9 & 5 \\ 1 & 1 & -3 & 4 \end{array}\right]$.

C) $\left[\begin{array}{ccc|c} 1 & 0 & 0 & -2 \\ 0 & 1 & -3 & 5 \\ 0 & 0 & 0 & 4 \end{array}\right]$.

D) $\left[\begin{array}{ccc|c} 1 & 0 & 0 & -2 \\ 0 & 1 & -3 & 5 \\ 0 & 1 & -3 & 4 \end{array}\right]$.

3) The result of pivoting the matrix $\left[\begin{array}{ccc} 1 & 3 & 5 \\ 5 & 6 & 2 \end{array}\right]$ about the element 6 is

A) $\left[\begin{array}{ccc} 1 & 3 & 5 \\ 3 & 0 & -8 \end{array}\right]$.

B) $\left[\begin{array}{ccc} -\frac{3}{2} & 0 & 4 \\ \frac{5}{6} & 1 & \frac{1}{3} \end{array}\right]$.

C) $\left[\begin{array}{ccc} 1 & 3 & 5 \\ \frac{5}{6} & 1 & \frac{1}{3} \end{array}\right]$.

D) $\left[\begin{array}{ccc} 1 & 2 & -\frac{8}{3} \\ 0 & 1 & \frac{23}{9} \end{array}\right]$.

4) The identity matrix of size 3 is

A) $\left[\begin{array}{ccc} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{array}\right]$.

B) $\left[\begin{array}{ccc} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{array}\right]$.

C) $\left[\begin{array}{ccc} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{array}\right]$.

D) $\left[\begin{array}{ccc} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{array}\right]$.

5) $\left[\begin{array}{cc} -5 & -2 \\ -4 & -9 \\ -2 & 7 \end{array}\right] + \left[\begin{array}{cc} 5 & -2 \\ 7 & -3 \\ -2 & -2 \end{array}\right] =$

A) $\left[\begin{array}{cc} 0 & -4 \\ -3 & -9 \\ -4 & -5 \end{array}\right]$

B) $\left[\begin{array}{cc} -10 & 0 \\ -11 & -6 \\ 0 & 3 \end{array}\right]$

C) $\left[\begin{array}{cc} 0 & -4 \\ 3 & -12 \\ -4 & 5 \end{array}\right]$

D) $\left[\begin{array}{cc} 0 & -9 \\ 3 & -12 \\ -4 & 5 \end{array}\right]$

6) $[4\ \ 0\ \ 6]\begin{bmatrix} 1 \\ 3 \\ -2 \end{bmatrix} =$

A) $\begin{bmatrix} 4 & 0 & 6 \\ 12 & 0 & 18 \\ -8 & 0 & -12 \end{bmatrix}$ B) $[-8]$ C) $[4 \quad 0 \quad -12]$ D) $\begin{bmatrix} 4 \\ 0 \\ -12 \end{bmatrix}$ E) $\begin{bmatrix} 4 & 12 & -8 \\ 0 & 0 & 0 \\ 6 & 18 & -12 \end{bmatrix}$

7) If B is a 4×2 matrix and A is a 3×4 matrix, then the size of AB is

A) 4×4.
B) 3×4 .
C) 3×2.
D) 2×3.
E) none of the above

8) Let $A = \begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & -2 \\ 4 & 6 \end{bmatrix}$. The entry in the second row, first column of AB is

A) 18. B) 8. C) 22. D) 6. E) 34.

9) The system $\begin{cases} x - 2y + z = 4 \\ 3x + y + z = 1 \\ x + y + 2z = 0 \end{cases}$ is equivalent to the matrix equation

A) $\begin{bmatrix} x \\ y \\ z \end{bmatrix}\begin{bmatrix} 1 & -2 & 1 \\ 3 & 1 & 1 \\ 1 & 1 & 2 \end{bmatrix} = \begin{bmatrix} 4 \\ 1 \\ 0 \end{bmatrix}$.

B) $\begin{bmatrix} 1 & -2 & 1 \\ 3 & 1 & 1 \\ 1 & 1 & 2 \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 4 \\ 1 \\ 0 \end{bmatrix}$.

C) $\begin{bmatrix} 1 & 3 & 1 \\ -2 & 1 & 1 \\ 1 & 1 & 2 \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 4 \\ 1 \\ 0 \end{bmatrix}$.

D) $\begin{bmatrix} x \\ y \\ z \end{bmatrix}\begin{bmatrix} 1 & 3 & 1 \\ -2 & 1 & 1 \\ 1 & 1 & 2 \end{bmatrix} = \begin{bmatrix} 4 \\ 1 \\ 0 \end{bmatrix}$.

10) Suppose one hour's output (measured in bottles) in a brewery is described by the following matrix:

	Production line 1	Production line 2
Regular Beer	300	200
Light Beer	400	100
Malt Beer	100	50

$= A$

Let $H = \begin{bmatrix} x \\ y \end{bmatrix}$ where x represents the number of hours Production line 1 is in operation in a day and y represents the number of hours Production line 2 is in operation in a day. Then the entry in the second row, first column of AH, represents

A) the total number of hours in a day spent producing light beer.
B) the total number of hours in a day spent producing regular beer.
C) the total number of bottles of light beer produced in a day.
D) the total number of bottles of regular beer produced in a day.
E) none of the above

11) The inverse of the matrix $\begin{bmatrix} 1 & -1 \\ -3 & 4 \end{bmatrix}$ is

A) $\begin{bmatrix} 4 & 1 \\ 3 & 1 \end{bmatrix}$.

B) $\begin{bmatrix} 4 & 1 \\ -3 & 1 \end{bmatrix}$.

C) $\begin{bmatrix} 4 & -1 \\ -3 & 1 \end{bmatrix}$

D) not defined.
E) none of the above

12) The feasible set of a certain linear programming problem is given by the following system of linear inequalities. Without graphing this set, determine which of the following points is *not* in the feasible set.

$$\begin{cases} 4x - 3y \geq 15 \\ 2x + 6y \geq 7 \\ y \leq 6 \end{cases}$$

A) (8, 4)
B) (7, 3)
C) (1, -3)
D) (8, -1)
E) none of the above

A candy merchant sells two variety bags of candy. Each pound of variety bag A contains 60% caramels and 40 % chocolates and sells for $8 a pound. Each pound of variety bag *B* contains 45% caramels and 55% chocolates and sells for $10 a pound. The merchant has available 400 pounds of caramels and 300 pounds of chocolate. The merchant will try to sell the amount of each blend that maximizes her income. Let x be the number of pounds of variety bag *A* and y be the number of pounds of variety bag *B.*

13) Since the merchant above has available 300 pounds of chocolates, one inequality that must be satisfied is in the situation above is

A) $.60x+.40y \leq 300$
B) $.40x+.55y \leq 300$
C) $.60x+.45y \leq 300$
D) $.45x+.55y \leq 300$
E) none of the above

14) In the situation above, the objective function is

A) .45x+.55y
B) 8x+10y
C) 400x+300y
D) .60x+.40y
E) none of the above

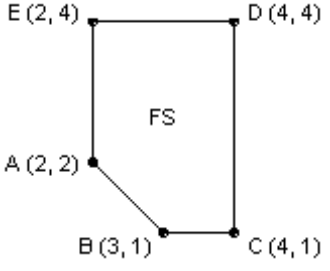
A small manufacturing plant produces three kinds of bicycles—three-speed, five-speed and ten-speed—in two factories. Factory *A* produces 16 three-speeds, 12 five-speeds and 30 ten-speeds in one day, while factory *B* produces 15 three-speeds, 18 five-speeds and 20 ten-speeds in one day. An order is received for 30 three-speeds, 40 five-speeds, and 50 ten-speeds. It costs $1200 a day to operate factory *A* and $3000 a day to operate factory *B*. The manufacturer chooses the number of days to operate each factory in order to minimize cost.

15) In the situation above, the variables are
   A) x = the number of days factory *A* is operated
      y = the number of days factory *B* is operated
   B) x = the number of days spent producing three-speeds
      y = the number of days spent producing five-speeds
      z = the number of days spent producing ten-speeds
   C) x = the number of three-speeds produced
      y = the number of five-speeds produced
      z = the number of ten-speeds produced
   D) x = the total cost to operate factory *A*
      y = the total cost to operate factory *B*
   E) none of the above

16) In the situation above, the objective function is
   A) $3000x + 1200y$.
   B) $30x + 40y + 50z$.
   C) $1200x + 3000y$.
   D) $58x + 53y$.
   E) none of the above

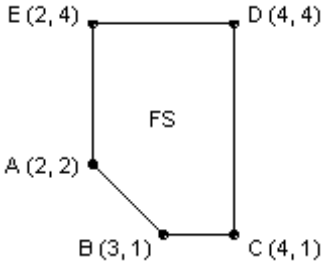
17) In the situation above, which of the following inequalities must be satisfied?
   A) $x + y \geq 120$
   B) $x + y + z \geq 120$
   C) $16x + 15y \geq 30$
   D) $30x + 20y \leq 50$
   E) none of the above

18) Consider the feasible set (FS) below of a certain linear programming problem.



The maximum value of the objective function $5x - y$ is
   A) 19.
   B) -40.
   C) 0.
   D) 30.
   E) none of the above

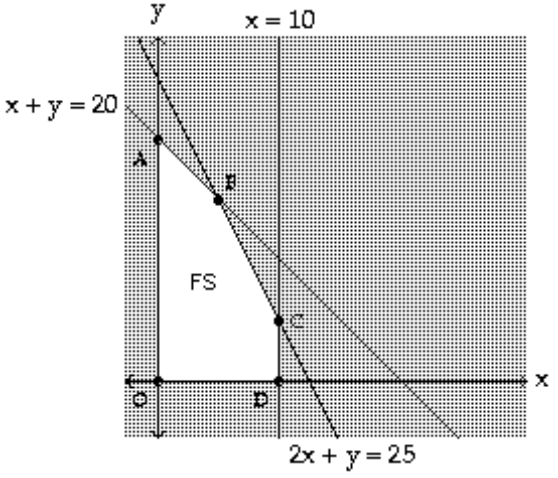
19) Consider the feasible set (FS) below of a certain linear programming problem.



The objective function $5x - y$ is maximized at point

A) *A.* B) *B.* C) *C.* D) *D.* E) *E.*

20) Consider the feasible set, FS, shown below.



The coordinates of vertex *B* are

A) (10, 6).
B) (5, 15).
C) (0, 20).
D) (10, 10).
E) none of the above

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Solve the problem.

21) For the feasible set (FS) below, find the coordinates of the point that minimizes $4x + 5y$. Find the minimum value of $4x + 5y$.