Review Session, May 19

For problems 1–4 consider the following linear equations:
Line A: $3x - 5y = 7$
Line B: $-x + 2y = 3$

1. What is the y-intercept of line A?
(a) $(-7/5, 0)$; $\boxed{(b)}$ $(0, -7/5)$; (c) $(0, 7)$; (d) $(7, 0)$; (e) None of these.

2. What is the x-intercept of line B?
(a) $(0, -3/2)$; (b) $(0, -3)$; (c) $(-3/2, 0)$; $\boxed{(d)}$ $(-3, 0)$; (e) None of these.

3. What is the point of intersection of lines A and B?
(a) $(16, 29)$; $\boxed{(b)}$ $(29, 16)$; (c) $(7, 3)$; (d) $(3, 7)$; (e) None of these.

4. What is the standard form of the equation for line A?
(a) $3x = 5y + 7$; (b) $5y = 3x - 7$; (c) $3x - 5y - 7 = 0$; $\boxed{(d)}$ $y = \frac{3}{5}x - \frac{7}{5}$; (e) None of these.

5. What is the slope of the line that is perpendicular to the line $-3x + 2y - 10 = 0$?
(a) $m = 3/2$; (b) $m = -3/2$; $\boxed{(c)}$ $m = -2/3$; (d) $m = 2/3$; (e) None of these.

6. Find the equation of the line that is parallel to the line $y = (-2/3)x + 2$ and passes through the point $(6, 0)$.
(a) $y = 3x + 2$; (b) $y = (3/2)x - 9$; $\boxed{(c)}$ $y = (-2/3)x + 4$; (d) $y = -2x + 3$; (e) None of these.

7. Find the equation of the vertical line that passes through $(-3, 5)$:
$\boxed{(a)}$ $x = -3$; (b) $y = 5$; (c) $-3x = 5$; (d) $-3x + 5y = 0$; (e) None of these.

8. Which of the following points satisfy the inequality $2x + 4y \leq 7$:
(a) $(2, 4)$; (b) $(-1, 3)$; (c) $(0, 2)$; $\boxed{(d)}$ $(1, 1)$; (e) None of these.

9. Which of the following points is in the feasible set of the system of inequlities:
$x \geq 0$
$x + y \leq 1$
$x - 2y \leq 8$
(a) $(2, 0)$; (b) $(-1, 2)$; (c) $(3, 2)$; (d) $(1, 10)$; $\boxed{(e)}$ None of these.

10. What is the slope of the line $5y + 7x - 43 = 0$?
(a) 7; (b) -7; $\boxed{(c)}$ $-\frac{7}{5}$; (d) $\frac{43}{5}$; (e) None of these.

11. Which of the following is NOT a valid row operation?
(a) Change a row by swapping it with another row;
(b) Change a row by multiplying each number in the row by a nonzero constant;
(c) Change a row by adding a nonzero multiple of another row;
$\boxed{(d)}$ Change a row by adding a nonzero constant to each element in the row;
(e) All of these are valid row operations.

12. For what value of k we will have: $\begin{bmatrix} -2 & 1 \\ 3 & k \\ 1 & 5 \end{bmatrix} \cdot \begin{bmatrix} 3 \\ 1 \end{bmatrix} = \begin{bmatrix} -5 \\ 5 \\ 8 \end{bmatrix}$

(a) $k = -1$; $\boxed{(b)}$ $k = -4$; (c) $k = 0$; (d) Undefined; (e) None of these.

13. Given the folowing system of inequalities $x + y \leq 6$, $x + 2y \geq 6$, $y \geq 1$, sketch the graph of the feasible set.

14. Solve the following system of equations using the Gaussian elimination:

$$x - 3y + 4z = 1$$
$$4x - 10y + 10z = 4$$
$$-3x + 9y - 5z = -6$$

15. The value y of a machine (in dollars) is known to depreciate linearly with time x (measured in years from the time it was bought new). Suppose that y is related to x by $y = 2,000 - 200x$.
(a) What is the value of the machine when it is 5 years old? `$1,000`
(b) When will the value of the machine reach the scrap value of \$400? `After 8 years`

16. Based on the following matrix, which quintuple is a solution of the system of linear equations:

$$\begin{bmatrix} 1 & 0 & -2 & 3 & 0 & -24 \\ 0 & 1 & -2 & 2 & 0 & -7 \\ 0 & 0 & 0 & 0 & 1 & 4 \end{bmatrix}$$

(a) $(0,0,0,0,0)$; (b) $(0,5,6,0,4)$; (c) $(1,0,-2,3,0)$; (d) $(1-,2,2,0,-7)$; $\boxed{(e)}$ None of these.

17. Given $A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}$, $B = \begin{bmatrix} 3 \\ -2 \\ 1 \end{bmatrix}$, $C = \begin{bmatrix} 2 \\ 5 \end{bmatrix}$ find $A \cdot B + C$:

(a) $A \cdot B$ is undefined; (b) $A \cdot B$ is defined but $A \cdot B + C$ is not; $\boxed{(c)}$ $\begin{bmatrix} 4 \\ 13 \end{bmatrix}$; (d) $\begin{bmatrix} 12 \\ 33 \end{bmatrix}$;

(e) None of these.

18. Which of the following matrices is the inverse of the matrix $\begin{bmatrix} 1 & 2 & 3 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$:

(a) $\begin{bmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ 3 & 0 & 1 \end{bmatrix}$; $\boxed{(b)}$ $\begin{bmatrix} 1 & -2 & -3 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$; (c) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$; (d) $\begin{bmatrix} -1 & -2 & -3 \\ 0 & -1 & 0 \\ 0 & 0 & -1 \end{bmatrix}$; (e) None of these.

19. Find a and b so that

$$\begin{bmatrix} 1 & 6 & -3 \\ 7 & 7 & 4 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} a & b & 0 \\ 2 & 6 & 1 \\ 4 & 2 & 2 \end{bmatrix} = \begin{bmatrix} -4 & 28 & 0 \\ 2 & 36 & 15 \\ 4 & 2 & 2 \end{bmatrix}$$ `a=-4, b=-2`

20. For which x the matrix $\begin{bmatrix} 3 & x \\ 4 & 36 \end{bmatrix}$ has no inverse? `For x=27`

21. The result of performing $[3]+5[2]$ on the matrix $\begin{bmatrix} 1 & 0 & 3 & 9 \\ 0 & 1 & -3 & 2 \\ 0 & -5 & 4 & 1 \end{bmatrix}$ is:

(a) $\begin{bmatrix} 1 & 0 & 3 & 9 \\ 0 & 0 & -3 & 2 \\ 0 & -5 & 4 & 1 \end{bmatrix}$; (b) $\begin{bmatrix} 1 & 0 & 3 & 9 \\ 0 & 1 & -3 & 2 \\ 0 & 0 & -11 & -11 \end{bmatrix}$; (c) $\begin{bmatrix} 1 & 0 & 3 & 9 \\ 0 & 1 & -3 & 2 \\ 10 & 5 & 14 & 11 \end{bmatrix}$;

(d) $\begin{bmatrix} 1 & 0 & 3 & 9 \\ 0 & -5 & -11 & 11 \\ 0 & -5 & 4 & 1 \end{bmatrix}$; $\boxed{(e)}$ None of these.

22. Solve the following system of equations using the Gaussian elimination:

$x - y + 2z = 2$

$y - 2z = 1$

$-3x + 5y - 10z = -4$

23. Minimize the objective function $-3y + 2x + 100$ over a bounded feasible region that has the vertices: $(0,0)$, $(0,10)$, $(2,12)$, $(3,5)$, $(10,0)$.

(a) 100; (b) 65; $\boxed{(c)}$ 68; (d) 70; (e) None of these.

For Problems 24–25: A coffee merchant sells two blends of coffee. Each pound of blend A contains 80% Mocha Java and 20% Jamaican and sells for \$2 a pound. Each pound of blend B contains 35% Mocha Java and 65% Jamaican and sells for \$2.25 a pound. The merchant has available 1000 pounds of Mocha Java and 600 pounds of Jamaican. The merchant will try to sell the amount of each blend that maximizes his income. Let x be the number of pounds of blend A and y be the number of pounds of blend B.

24. The objective function is:

(a) $.35x + 2y$; (b) $.80x + .20y$; (c) $2.25x + .2y$; (d) $1000x + 600y$; $\boxed{(e)}$ None of these.

25. One inequality that must be satisfied is:

(a) $.35x + .65y \geq 1000$; (b) $.8x + .2y \leq 1000$; $\boxed{(c)}$ $.8x + .35y \leq 1000$; (d) $.8x + .35y \geq 1000$; (e) None of these.

26. Maximize the objective function $3x+y$ subject to the constraints: $2x+y \leq 25$, $x+y \leq 20$, $x \leq 12$, $x \geq 0$, $y \geq 0$. `Maximum is 37`

For Problems 27–29: New cars are transported from docks in Baltimore and New York to dealerships in Pittsburgh and Philadelphia. The dealership in Pittsburgh needs 20 cars and the dealership in Philadelphia needs 15 cars.It costs \$60 to transport a car from Baltimore to Pittsburgh, \$45 to transport a car from Baltimore to Philadelphia, \$65 to transport a car from New York to Pittsburgh, and \$40 to transport a car from New York to Philadelphia. There are 30 cars on the docks in Baltimore and there are 18 cars on the docks in New York. The number of cars sent from each dock to each dealership is chosen to minimize total transportation costs. Let x represent the number of cars sent from Baltimore to Philadelphia and let y represent the number of cars sent from New York to Pittsburgh.

27. The number of cars sent from Baltimore to Pittsburgh is given by:
(a) $20 - x$; $\boxed{(b)}$ $20 - y$; (c) $30 - x$; (d) $30 - y$; (e) None of these.

28. The objective function is:
(a) $45x + 64y$; (b) $105x + 105y$; (c) $-15x + 15y + 180$; $\boxed{(d)}$ $5x + 5y + 1800$; (e) None of these.

29. Which if the following inequalities must be satisfied:
(a) $-x + y \leq 0$; (b) $x + y \geq 3$; $\boxed{(c)}$ $x - y \leq 10$; (d) $x - y \geq 10$; (e) None of these.

For Problems 30–32: There is exactly \$10,000 in a trust fund which is to be invested among three types of bonds, A, B, and C, which yield 5%, 6%, and 7%, respectively, on the investment. The total yield must be at least \$600, no less than \$3000 may be invested in B bonds, and no more than \$2000 may be invested in A bonds. Let x and y represent the amounts invested in A and B bonds.

30. What amount is invested in bonds C?
(a) $10,000 - x + y$; $\boxed{(b)}$ $10,000 - x - y$; (c) $10,000 + x - y$; (d) $x + y - 10,000$; (e) None of these.

31. Which of the following inequalities must be satisfied?
(a) $y \leq 3000$; (b) $2x + y \leq 10,000$; (c) $x + y \leq 5000$; (d) $.05x + .06y \geq 600$; $\boxed{(e)}$ None of these.

32. The maximum possible yield is:
(a) \$600; (b) \$630; $\boxed{(c)}$ \$670; (d) \$700; (e) None of these.