Math 210 Exam 2 St. Patty, 1999 Form A Name _____

Section _____

"None" means "None of the previous answers is correct."

1. A manufacturer produces chairs, tables, and desks. Each product needs carpentry and finishing. A chair needs an hour of carpentry and two hours of finishing. A table needs 2 hours of carpentry and 2 hours of finishing. Desks need 4 hours of carptentry and 3 hours of finishing. There are 240 hours of carpentry and 320 hours of finishing available. He also wants to make at least as many chairs as tables and desks combined. The manufacturer wishes to maximize profits of \$20 per chair, \$40 per table, and \$50 per desk.
Which of the following is one of the constraints?

I. $20x + 40y + 50z \leq 320$ II. $x + 2y + 4z \geq 240$ III. $x - y - z \geq 0$

(a) all three (b) II, III (c) II only (d) I, III (e) None

2. Mr. Jones has \$9000 to invest in three types of stocks: low-risk, medium risk, and high-risk. He invests according to three principles. The amount invested in low-risk stocks will be at most \$1000 more than the amount invested in medium-risk stocks. At least \$5000 will be invested in low- and medium risk stocks. No more than \$7000 will be invested in medium- and high-risk stocks. The expected yields are 6% for low-risk stocks, 7% for medium-risk stocks, and 8% for high-risk stocks. If x is the amount of money Mr. Jones invests in low-risk stocks and y is the amount of money he invests in medium-risk stocks, what is the objective function for his total yield, which he wants to maximize?

(a) $720 - .02x - .01y$ (b) $720 - .06x - .07y$ (c) $720 - .94x - .93y$ (d) $9000 - .06x - .07y$
(e) None

3. Which of the following is *not* a corner point of the region:

$$\begin{aligned} 2x + y &\leq 25 \\ x + y &\leq 20 \\ x &\leq 12 \\ x \geq 0, y &\geq 0 \end{aligned}$$

(a) (0,0) (b) (0,25) (c) (5,15) (d) (12,1) (e) (12,0)

4. The function, $P = 7x + 8y$, is to be minimized over a triangular shaped region, whose corner points are $A = (2, 9)$, $B = (5, 11)$, and $C = (13, 1)$. What is the minimum value of P?

(a) 0 (b) 56 (c) 15 (d) 86 (e) None

5. Determine the location of the next pivot in the tableau:

$$\begin{bmatrix} x & y & z & u & v & w & M & \\ 0 & 0 & \frac{1}{2} & 1 & \frac{4}{3} & \frac{3}{2} & 0 & 12 \\ 0 & 1 & -\frac{2}{3} & 0 & 2 & 2 & 0 & 20 \\ 1 & 0 & 2 & 0 & 1 & \frac{1}{3} & 0 & 32 \\ 0 & 0 & -8 & 0 & -10 & 4 & 1 & 60 \end{bmatrix}$$

(a) row 3, col. 3 (b) row 2, col. 5 (c) row 1, col. 3 (d) row 1, col. 5 (e) None

6. Pivot on the underlined entry 3 in row 1, column 2, in the following tableau:

$$\begin{bmatrix} x & y & u & v & M & \\ 2 & \underline{3} & 1 & 0 & 0 & 12 \\ 1 & 1 & 0 & 1 & 0 & 10 \\ -10 & -20 & 0 & 0 & 1 & 0 \end{bmatrix}$$

Which of the following statements are true of the new tableau?

I. Another pivot is necessary.

II. The optimal value is 80.

(a) both are true (b) I only (c) II only (d) neither is true (e) None

7. Read the *current* solution (x, y, z) from the following tableau:

$$\begin{bmatrix} x & y & z & u & v & w & M & \\ 0 & 1 & 0 & 1 & 1 & 1 & 0 & 4 \\ 0 & 0 & 1 & -2 & 0 & 0 & 0 & 8 \\ 1 & 1 & 0 & 4 & 1 & 0 & 0 & 3 \\ 0 & 0 & 0 & -3 & -6 & 0 & 1 & 20 \end{bmatrix}$$

(a) $(4, 8, 3)$ (b) $(3, 0, 8)$ (c) $(3, 4, 8)$ (d) $(3, 3, 8)$ (e) None

8. Which of the following linear programming systems are in standard form:

I. Maximize $2x - 3y$ subject to

$$-x + 2y \leq 6$$
$$y \leq 4$$
$$x, y \geq 0$$

II. Minimize $2x + 3y$ subject to

$$x + 3y \geq 20$$
$$6x - 2y \leq 30$$

III. Maximize $4x - y$ subject to

$$-x + y \leq 0$$
$$2x + y \leq 8$$
$$x, y \geq 0$$

(a) all three (b) I only (c) III only (d) II and III (e) None

9. Which of the following statements are true regarding a given Simplex tableau?

I. If there are negative numbers in the far right column (and above the bottom row), then the system is not in standard form.

II. If there are no negative values in the bottom row, then the problem is finished.

(a) both are true (b) I only (c) II only (d) neither is true (e) None

10. Which of the following statements are true regarding linear programming problems?

I. In order to use the Simplex method to minzimize a function M, you must maximize $P = -M$.

II. If the maximum of P occurs at (x, y), then the minimum of $M = -P$ occurs at $(-x, -y)$.

(a) both are true (b) I only (c) II only (d) neither is true (e) None

11. Let

$$U = \{1, 3, 5, 7, 9, 11\} \qquad A = \{1, 5, 9, 11\} \qquad B = \{3, 5, 7\} \qquad C = \{1, 3, 11\}.$$

Find $A' \cup B \cup C$.

(a) $\emptyset$ (b) $\{3\}$ (c) $\{1, 3, 5, 7, 11\}$ (d) U (e) None

12. How many subsets does the set $\{1, 2\}$ have?

(a) 1 (b) 2 (c) 3 (d) 4 (e) None

13. A school with 400 students offers Math and English. If 250 students are *not* taking Math, 250 are enrolled in English, and 100 signed up for both, how many students are in neither class?

(a) 50 (b) 100 (c) 150 (d) 0 (e) None

The next two problems use the following information.

A merchant surveyed 400 people to determine the way they learned about an upcoming sale. The survey showed that 180 learned about the sale from the radio, 185 learned about the sale from TV, and 180 learned about the sale from the newspaper. Fifty people learned about the sale from the radio only, 60 people from TV only, and 70 from the newspaper only. In addition, 100 people learned about the sale from radio and TV.

14. How many people sampled learned of the sale from all three sources?

(a) 30 (b) 45 (c) 55 (d) 100 (e) None

15. How many people learned about the sale from radio or TV, but not both?

(a) 165 (b) 205 (c) 265 (d) 365 (e) None