MATH 210 **PRACTICE EXAM 3** **APR, 2007**

For the next two problems consider the following linear programming problem: Maximize $P = 15x + 12y$ subject to the constraints:

$$\begin{aligned} 5x + 4y &\leq 20 \\ x, y &\geq 0 \end{aligned}$$

[1A] The maximum occurs for :
(a) At $x = 0, y = 5$ and $x = 4, y = 0$ ONLY.
(b) $x = 20, y = 20$ ONLY.
(c) Along the line segment joining $x = 0, y = 5$ to $x = 4, y = 0$.
(d) Along the line segment joining $x = 0, y = 5$ to $x = 20, y = 0$.
(e) Some other value of x and y.

[2A]
The maximum is :
(a) 10.
(b) 20.
(c) 40.
(d) 60.
(e) None of the above.

[3A] Find the value of the pivot element in the following simplex tableau:

$$\left(\begin{array}{cccccccc|c} 1 & 0 & -1 & 1 & 0 & 0 & 1 & 0 & 1 \\ 2 & 0 & -2 & 0 & 1 & 0 & 2 & 0 & -4 \\ 4 & 1 & 0 & 0 & 0 & 0 & -3 & 0 & 1 \\ -3 & 0 & 5 & 0 & 0 & 1 & -6 & 0 & 5 \\ \hline -6 & 0 & 3 & 0 & 0 & 0 & 2 & 1 & 4 \end{array}\right)$$

(a) 3.
(b) -2.
(c) 2.
(d) -1.
(e) 5.

For the next two problems consider the following linear programming problem:
Maximize $P = 2x + 3y + 2z$ subject to the constraints:

$$\begin{aligned} 2x + y + 2z &\leq 26 \\ x + y - 3z &\leq 16 \\ x, y, z &\geq 0 \end{aligned}$$

[**4A**] The maximum is:
(a) 5.
(b) 15.
(c) 24.
(d) 70.
(e) None of the above

[**5A**] The optimal solution is:
(a) $x = 5,\ y = 8,\ z = 0.$
(b) $x = 0,\ y = 22,\ z = 2.$
(c) $x = 0,\ y = 22,\ z = 6.$
(d) $x = 1,\ y = 11,\ z = 12.$
(e) None of the above.
For the next two problems:
Minimize $C = -10x + 14y - 2z$ subject to the constraints:

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

[**6A**] The minimum is:
(a) -5.
(b) -10.
(c) 5.
(d) 10.
(e) None of the above.

[**7A**] The optimal solution is:
(a) $x = 1,\ y = 0,\ z = 0.$
(b) $x = 0,\ y = 0,\ z = 2.$
(c) $x = 2,\ y = 0,\ z = 0.$
(d) $x = 0,\ y = 1,\ z = 0.$
(e) $x = 0,\ y = 2,\ z = 0.$

For the next two problems consider the following linear programming problem:
Maximize $P = 3x - 7y + z$ subject to the constraints:

$$\begin{aligned} x - 2y + 3z &\leq -90 \\ x + 2y + z &\leq 120 \\ x, y, z &\geq 0 \end{aligned}$$

[8A] The maximum is:
(a) 315.
(b) -108.
(c) -315.
(d) -36.
(e) None of the above.

[9A] The optimal solution is:
(a) $x = 6,\ y = 0,\ z = 0.$
(b) $x = 0,\ y = 18,\ z = 0.$
(c) $x = 6,\ y = 45,\ z = 0.$
(d) $x = 0,\ y = 45,\ z = 0.$
(e) None of the above.

For the next three problems:
Mom's Old-Fashioned Casseroles produces a luncheon casserole that has 50% carbohydrates, 30% protein and 20% fat and costs \$8.00 per pound. The dinner casserole has 75% carbohydrates, 20% protein and 5% fat and costs \$10.00 per pound. How much of each should be produced to provide at least 3 pounds of carbohydrates, at least 1.5 pounds of protein and at most 0.5 pounds of fat at minimum cost? [HINT: Use the graphical method.]

[10A] Amount of luncheon casserole to be produced:
(a) None.
(b) 1 pound.
(c) 1.8 pounds.
(d) 6 pounds.
(e) None of the above.

[11A] Amount of dinner casserole to be produced:
(a) None.
(b) 1 pound.
(c) 1.8 pounds.
(d) 6 pounds.
(e) None of the above.

[12A] Minimum cost is:
(a) \$68.00
(b) \$34.00
(c) \$18.75
(d) \$25.00
(e) None of the above.

[13A] How many vertices has the feasible set for:

$$\begin{aligned} x - y &\leq 15 \\ 2x - y &\leq 15 \\ x + y &\geq 6 \\ x &\geq 0 \\ y &\geq 0 \end{aligned}$$

(a) 1.
(b) 2.
(c) 3.
(d) 4.
(e) 5.

[14A] Is more pivoting needed in the following simplex tableau?

$$\left(\begin{array}{cccccccc|c} 1 & 0 & 0 & 1 & 0 & 0 & -1 & 0 & 1 \\ 5 & 3 & 1 & 0 & 0 & 0 & 2 & 0 & 3 \\ 7 & -2 & 0 & 0 & 1 & 0 & -3 & 0 & 2 \\ 4 & 4 & 0 & 0 & 0 & 1 & -6 & 0 & 3 \\ \hline 15 & 10 & 0 & 0 & 0 & 0 & 2 & 1 & 4 \end{array}\right)$$

(a) No
(b)Yes: Pivot about a 3
(c)Yes: Pivot about a -3
(d)Yes: Pivot about a -6
(e)Yes: Pivot about a -1

[15A] Which of the following statements are true for the feasible set?
(A) A linear objective function might not have a maximum on it
(B) The feasible set is always convex
(C) The feasible could be empty

(a) A only
(b) B only
(c) C only
(d) B and C only
(e) A, B and C

NOTE: There are no problems on this practice test from Section 5.1.