MATH 210 EXAM 3 FORM A November 24, 2014

Name (printed) _____

Name (signature) _____ ZID No. _____

INSTRUCTIONS:

(1) Use a No. 2 pencil.
(2) Work on this test. No scratch paper is allowed.
(3) Write your name and ZID number on your answer sheet, filling in the corresponding ovals.
(4) Write your recitation section in the boxes marked "Section," beginning with a zero:
01 = Tues 1–2 02 = Tues 2–3 03 = Thurs 1–2 04 = Thurs 2–3
(5) This test is Form A and should have a RED answer sheet. Fill in A in the oval corresponding to Form number on your answer sheet.
(6) Check that there are 15 questions on your examination form.
(7) Check your scantron carefully for errors and then sign your name on the back.
(8) "NOTA" means "none of the above answers is correct."

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(1) True or False?

I. The solution set of a linear inequality involving two variables is either a half plane or a line.

II. The solution set of a linear inequality in two variables is bounded if it can be enclosed in a rectangle.

(a) both I and II are true
(b) I is true, II is false
(c) I is false, II is true
(d) both I and II are false

(2) True or False?

I. If the maximum of an objective function P occurs at (x, y), then the minimum of $C = -P$ occurs at $(-x, -y)$.

II. A linear objective function might not have a maximum on it.

(a) both I and II are true
(b) I is true, II is false
(c) I is false, II is true
(d) both I and II are false

(3) A feasible region has five corner points:
(a) $(8, 2)$
(b) $(4, 6)$
(c) $(28, 8)$
(d) $(16, 24)$
(e) $(3, 16)$
Which of these minimize the objective function $C = 3x - y$?

For the next three questions, solve the following problem by the method of corners:
Maximize $C = 6x + 2y$ subject to

$$x + 2y \leq 12$$
$$x + y \leq 8$$
$$2x - 3y \geq 6$$
$$x \geq 0, y \geq 0$$

(4) In the solution, the value of x is
(a) 4 (b) 6 (c) 48/7 (d) 8 (e) 12

(5) In the solution, the value of y is
(a) 0 (b) 2 (c) 4 (d) 18/7 (e) 8

(6) In the solution, the maximum value of C is
(a) 18 (b) 32 (c) 40 (d) $46\frac{2}{7}$ (e) 48

The next two questions ask you to formulate (but not solve) the following linear programming problem:

Boise Lumber has decided to enter the lucrative prefabricated housing business. Initially, it plans to offer three models: standard, deluxe, and luxury. Each house is prefabricated and partially assembled in the factory, and the final assembly is completed on site. The dollar amount of building material required, the amount of labor (in hours) required in the factory for prefabrication and partial assembly, the amount of on-site labor required, and the profit per unit are as follows:

	Standard	Deluxe	Luxury
Material	6000	8000	10000
Factory Labor	240	230	200
On-site Labor	180	210	300
Profit	\$3400	\$4000	\$5000

For the first year's production, a sum of \$8.2 million is budgeted for the building material; the number of labor hours available for work in the factory (for prefabrication and partial assembly) is not to exceed 218,000 hours; and the amount of labor for on-site work is to be less than or equal to 237,000 labor-hours.

Let x be the number of standard houses, y be the number of deluxe houses, and z be the number of luxury houses. What values of x, y, and z maximize profit?

(7) Which of the following is a constaint to the linear programming problem?
- (a) $6000x + 8000y + 10000z \leq 8,200,000$
- (b) $240x + 230y + 200z \leq 237,000$
- (c) $180x + 210y + 300z \leq 218,000$
- (d) $3400x + 4000y + 5000z \leq 8,200,000$
- (e) NOTA

(8) Which of the following is the function to be maximized?
- (a) $6000x + 8000y + 10000z$
- (b) $240x + 230y + 200z$
- (c) $180x + 210y + 300z$
- (d) $3400x + 4000y + 5000z$
- (e) NOTA

(9) Convert the constraint $3x - 5y \geq -27$ to an inequality involving $\leq$:
- (a) $3x - 5y \leq -27$
- (b) $-3x + 5y \leq 27$
- (c) $3x - 5y \leq 27$
- (d) $-3x + 5y \leq -27$
- (e) NOTA

(10) Which of the following statements about the dual of the following minimization problem is false?

Minimize $C = 12x + 4y + 8z$ subject to

$$2x + 4y + z \geq 6$$
$$3x + 2y + 2z \geq 2$$
$$4x + z \geq 2$$
$$x \geq 0, y \geq 0, z \geq 0$$

(a) The dual problem is a maximization
(b) $2u + 3v + 4w \leq 12$
(c) $4u + 2v + w \leq 4$
(d) $u + 2v + w \leq 8$
(e) The objective function is $6u + 2v + 2w$

For the next two problems solve the regular linear programming problem that has the following tableau.

x	y	z	u	v	P	const
3	0	5	1	1	0	28
2	1	3	0	1	0	16
-2	0	8	0	3	1	48

(11) The maximum is:
(a) 12 (b) 28 (c) 48 (d) 64 (e) NOTA

(12) In the optimal solution, the value of z is:
(a) 0 (b) 4 (c) 8 (d) 16 (e) NOTA

(13) Fill in the blank: In setting up the initial tableau, we first transform the system of linear inequalities into a system of linear equations using _____.
(a) basic variables
(b) slack variables
(c) pivots
(d) the dual method
(e) NOTA

(14) Suppose that the primal problem for a linear programming is
Minimize $C = 2x + 5y$ subject to

$$3x + 2y \geq 8$$
$$x + 4y \geq 6$$
$$x \geq 0,\ y \geq 0$$

and the final simplex tableau for the dual problem maximization is

$$\left(\begin{array}{cccccc|c} u & v & x & y & P & \text{const} \\ \hline 1 & 0 & \frac{2}{5} & -\frac{1}{10} & 0 & \frac{3}{10} \\ 0 & 1 & -\frac{1}{5} & \frac{3}{10} & 1 & \frac{11}{10} \\ \hline 0 & 0 & 2 & 1 & 1 & 9 \end{array}\right)$$

What is the solution to the primal problem?
(a) $x = \frac{3}{10}$, $y = \frac{11}{10}$, $C = 9$
(b) $x = 2$, $y = 1$, $C = 9$
(c) $x = \frac{3}{10}$, $y = \frac{11}{10}$, $C = -9$
(d) $x = 2$, $y = 1$, $C = -9$
(e) NOTA

(15) Determine the location of the next pivot point in the following Simplex tableau.

$$\left(\begin{array}{ccccc|c} x & y & u & v & P & \text{const} \\ \hline 2 & 1 & 1 & 0 & 0 & 40 \\ -1 & 5 & 0 & 1 & 1 & -15 \\ \hline 3 & -4 & 0 & 0 & 0 & 10 \end{array}\right)$$

(a) row 1, column 1
(b) row 1, column 2
(c) row 2, column 1
(d) row 2, column 2
(e) NOTA