Prince Sultan University

Department of Mathematical Sciences

Major II Exam

Semester II, 2011 A SPRING (102)

April 23, 2011

MATH 101 – Finite Mathematics

Time Allowed : 90 minutes
Maximum Points: 100 points

Name of the student:_____

ID number :_____

Section : _____

Important Instructions:

1. You may use a scientific calculator that does not have programming or graphing capabilities.
2. You may NOT borrow a calculator from anyone.
3. You may NOT use notes or any textbook.
4. There should be NO talking during the examination.
5. Your exam will be taken immediately if your mobile phone is seen or heard
6. Looking around or making an attempt to cheat will result in your exam being cancelled
7. This examination has 11 problems, some with several parts and a total of 8 pages. Make sure your paper has all these problems.

Question	Maximum score	Your Score
Q.1	15	
Q.2 , Q.3	18	
Q.4 ,Q.5 , Q.6 , Q.7	25	
Q.8 , Q.9	18	
Q.10 , Q.11	24	
Total	**100**	

Q.1 (15 points) Circle the correct answer.

1) The following linear programming problem

$$\text{Maximize } P = 2x_1 - 6x_2$$

subject to the constraints

$$7x_1 + 7x_2 \le 100$$
$$4x_1 - 4x_2 \ge -80$$
$$x_1 \ge 0 \text{ and } x_2 \ge 0$$

(a) is in standard form (b) is not in standard form, but can be modified

(c) is not in standard form and can't be modified (d) can't be determined

2) The following linear programming problem

$$\text{Minimize } C = 2x_1 - 4x_2$$

subject to the constraints

$$2x_1 + 5x_2 \le 170$$
$$3x_1 + 4x_2 \ge 70$$
$$x_1 \ge 0 \text{ and } x_2 \ge 0$$

(a) is in standard form (b) is not in standard form, but can be modified

(c) is not in standard form and can't be modified (d) can't be determined

3) Without graphing, determine which of the points $P_1 = (-4,1)$, $P_2 = (0,5)$, $P_3 = (0,-4)$ are part of the graph of the following system:

$$\begin{cases} 2x - 3y \le 0 \\ 4x + y \le 0 \end{cases}$$

(a) P_1 (b) P_1, P_2 (c) P_2, P_3 (d) P_1, P_2, P_3

4) The *basic variables* in the following simplex tableau are:

P	x_1	x_2	s_1	s_2	RHS
0	1	3	0	5	14
0	0	4	1	−3	10
1	0	3	0	4	26

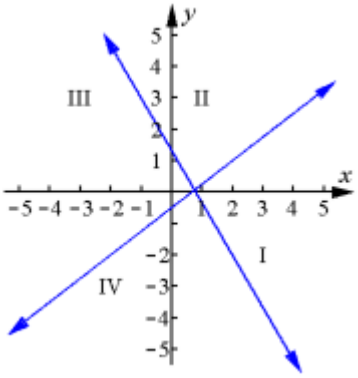
(a) x_1, s_1, and s_2 (b) x_1, s_1, and P (c) x_1, x_2, and P (d) x_2, s_2, and P

5) Find the effective rate of interest for an amount of money invested at 5.9% compounded quarterly.

(a) 6% (b) 5.43% (c) 6.03% (d) 11.8%

6) Determine which region I, II, III, or IV represents the graph of the given system of linear inequalities. The regions I, II, III, and IV are no overlapping regions bounded by the indicated lines.

$$\begin{cases} 3x-4y \le 2 \\ 5x+3y \le 4 \end{cases}$$



(a) IV (b) II (c) III (d) I

7) Locate the pivot element in the following tableau

$$\left[\begin{array}{ccccccc|c} 0 & 2 & 0 & 4 & 1 & 5 & 0 & 3 \\ 0 & 1 & -1 & 2 & 0 & -3 & 0 & -2 \\ 0 & 3 & 0 & -1 & 0 & -2 & 1 & 5 \\ \hline 1 & -6 & 0 & -8 & 0 & \frac{1}{2} & 0 & 1200 \end{array}\right]$$

(a) row 1, col 2 (b) row 1, col 4 (c) row 3, col 2 (d) row 2, col 3

8) What is 56% of 900?

(a) 50.4 (b) 1008 (c) 507 (d) 504

9) If $ 24,000 is borrowed for 10 months at a simple interest rate of 5.4% per annum, how much interest is due?

(a) $108 (b) $1080 (c) $1404 (d) $216

10) If You are offered a discounted loan of $20,000 at 8% interest rate for 15 months. How much will you be actually taking home with you?

(a) $22,500 (b) $22,000 (c) $25,000 (d) $18,000

Q.2 (12 points) Use **geometric approach** to maximize the quantity $z = 2x + 4y$ subject to the given constraints:

$$\begin{cases} x + y \geq 5 \\ x + y \leq 9 \\ x + 3y \leq 21 \\ x \geq 0 \\ y \geq 0 \end{cases}$$

Q.3 (6 points) A company produces men's shirts and pants. One shirt requires 15 minutes to produce. One pant requires 20 minutes to produce. The company has 800 minutes of production time each day. The company makes a profit of \$35 for each shirt, and \$25 for each pant. The company would like to maximize profit, but material is limited so it can produce, at most, 70 items in a day.
Write the linear programming problem that describes the situation. **Don't Solve.**

Q.4 (6 points) A bank pays interest of 6% compounded semiannually. If $\$2240$ is invested in a savings account. How much money is in the account after 9 years?

Q.5 (6 points) A bank pays interest of 4.3% compounded daily. If an investment is placed in a savings account, and $\$681.52$ in interest is accumulated after 3 years, how much was the initial investment?

Q.6 (7 points) A car dealer offers Mike the choice of two loans:

- $\$3000$ for 4 years at 12% per annum simple interest
- $\$3000$ for 4 years at 10% compounded semiannually

Which loan costs Mike the least? Show your work.

Q.7 (6 points) How many years will it take to save $\$110,000$ if you invest $\$60,000$ in an account paying 10% per annum compounded continuously.

Q.8 (6 points) Find the monthly payment required to save $\$50,000$ after 5 years, if you place the money in an account paying 9.5% compounded monthly.

Q.9 (12 points) Use the **Simplex Method** to solve the following maximum problem:

Maximize $P = 8x_1 + 4x_2 + 3x_3$ subject to the constraints

$$8x_1 + 2x_2 + 4x_3 \leq 120$$
$$5x_2 + 6x_3 \leq 45$$
$$x_1 \geq 0, x_2 \geq 0, \text{and } x_3 \geq 0$$

Q.10 (12 points) Write the **Dual Problem** for the following linear programming problem.

Don't Solve

Minimize $C = 5x_1 + 4x_2$ subject to the constraints

$$10x_1 + 6x_2 \geq 900$$
$$4x_1 + 9x_2 \geq 95$$
$$x_1 \geq 0 \text{ and } x_2 \geq 0$$

Q.11 (12 points) Use the **Simplex Method** to solve the following linear programming problem:

Minimize $C = 3x_1 + 5x_2$ subject to the constraints

$$x_1 - x_2 \leq 20$$
$$x_1 + x_2 \geq 50$$
$$2x_1 - 2x_2 \geq 40$$
$$x_1 \geq 0, x_2 \geq 0$$