# Prince Sultan University

## Department of Mathematics and Physical Sciences

***Final Exam***

**Semester II, 2008-2009 Spring (082)**

**29 June 2009**

# MATH 101 – Finite Mathematics

## Time Allowed : 150 minutes

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**Student Name:** **Section:**

**ID Number:** **Instructor's Name:**

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| Question | Maximum score | Your Score |
|---|---|---|
| Q.1, Q.2, Q.3 | 14 | |
| Q.4, Q.5 | 11 | |
| Q.6, Q.7 | 17 | |
| Q.8, Q.9, Q.10 | 19 | |
| Q.11, Q.12, Q.13, Q.14 | 19 | |
| Q.15, Q.16, Q.17 | 20 | |
| **Total** | **100** | |

**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 heard.
6-Looking around or making an attempt to cheat will result in your exam being cancelled.
7-This exam has 12 problems, some with several parts and a total of 7 pages. Make sure your papers have all these problems.

**Q.1 [3 points]** Find the general form of the line with $x$-intercept -3 and $y$-intercept 4.

**Q.2 [4 points]** A manufacturer produces items at a daily cost of $1.25 per item and sells them for $2 per item. The daily operational overhead is $450. What is the break-even point?

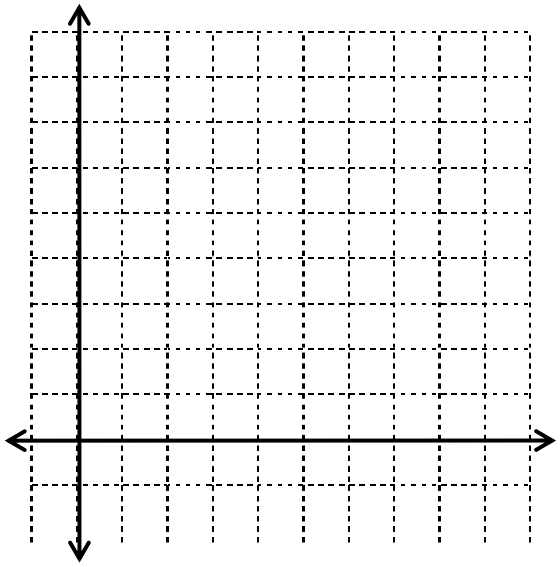
**Q.3 [7 points]** Use matrices to solve the system $\begin{cases} x + y = 5 \\ x - z = 8 \\ x + z = -2 \end{cases}$.

**Q.4 [6 points]** Find the inverse of $\begin{bmatrix} 2 & 1 & 1 \\ 0 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$

**Q.5 [5 points]** Let $A = \begin{bmatrix} -1 & 3 \\ 1 & 9 \end{bmatrix}$ and $B = \begin{bmatrix} 0 & -2 \\ 1 & 5 \end{bmatrix}$. Check whether the following identity $(A+B)^2 = A^2 + 2AB + B^2$ is true or false.

**Q.6 [8 points]** Use the **geometric approach** to find the maximum and minimum values of the objective function: $z = x + 4y$

Subject to the constraints $\begin{cases} x + 3y \le 9 \\ 2x + y \ge 8 \\ x \ge 0, y \ge 0 \end{cases}$



**Q.7 [9 points]** Find the solution, if any, of each maximum LP problem that has the given Simplex tableau:

**(a)**

| $P$ | $x_1$ | $x_2$ | $s_1$ | $s_2$ | $RHS$ |
|---|---|---|---|---|---|
| 0 | 2 | 1 | 1 | 0 | 3 |
| 0 | 1 | 0 | −1 | 1 | 2 |
| 1 | 4 | 0 | 2 | 0 | 12 |

**(b)**

| $P$ | $x_1$ | $x_2$ | $s_1$ | $s_2$ | $RHS$ |
|---|---|---|---|---|---|
| 0 | 0 | −2 | 1 | 1 | 4 |
| 0 | 1 | 0 | 0 | 1 | 5 |
| 1 | 0 | −3 | 0 | 1 | 10 |

**(c)**

| $P$ | $x_1$ | $x_2$ | $s_1$ | $s_2$ | $RHS$ |
|---|---|---|---|---|---|
| 0 | −1 | 2 | 1 | 0 | −4 |
| 0 | 1 | 1 | 0 | 1 | 10 |
| 1 | 2 | 1 | 0 | 0 | 0 |

**Q.8 [8 points]** Use the **Simplex method** to solve the following LP problem:

Minimize: $C = 3x_1 + 2x_2$

Subject to the constraints $\begin{cases} x_1 + x_2 \geq 10 \\ x_1 - x_2 \leq 15 \\ x_1 \geq 0, x_2 \geq 0 \end{cases}$

**Q.9 [5 points]** How long will it take for an investment to triple in value if it is invested at 8% compounded continuously?

**Q.10 [6 points]** A person wishes to borrow 18000 SR for 10 months and is offered a discounted loan at 8.5 %. Find the amount that a borrower must repay at the end of the 10 months.

**Q.11 [5 points]** Use the following probability table to obtain probabilities for events in a sample space.

**a)** $P(\overline{E}) =$
**b)** $P(E \cap H) =$
**c)** $P(E \cup F) =$
**d)** $P(I/G) =$
**e)** $P(F/H) =$

| | E | F | G | |
|---|---|---|---|---|
| H | 0.10 | 0.06 | 0.08 | |
| I | 0.30 | 0.14 | 0.32 | |
| | | | | |

**Q.12 [4 points]** You are to pick a computer password that consists of 4 places (either letters or numbers). How many different passwords can you possibly have if repeated letters and numbers are allowed?

**Q.13 [6 points]** Consider the word 'HOLIDAY'.

**a)** How many different ways are there to arrange the 7 letters?

**b)** If we insist that the letter 'H' comes first, how many ways are there?

**c)** If we insist that the letter 'H' comes first and the letter 'Y' comes last, how many ways are there?

**Q.14 [4 points]** A group of 9 people is going to be formed into committees of 4, 3 and 2 people. How many committees can be formed if

**a)** A person can serve on any number of committees.

**b)** No person can serve on more than one committee.

**Q.15 [9 points]** At a repair shop, the manager has found that a car will require a tune-up with a probability of 0.6, a brake job with a probability of 0.1 and both with a probability of 0.02.

**a)** What is the probability that a car requires either a tune-up or a brake job?

**b)** What is the probability that a car requires a tune-up but not a brake job?

**c)** What is the probability that a car requires neither type of repair?

**Q.16 [5 points]** There are 51 Democrats and 49 Republicans in the U.S. senate. A committee of seven senators is to be formed by selecting members of the senate randomly.

**a)** What is the probability the committee is composed of all Democrats?

**b)** What is the probability the committee is composed of 4 Democrats and 3 Republicans?

**Q.17 [6 points]** Tanya invested 2000$ in an Individual Retirement Account (IRA) each year for 10 years earning 8% compounded annually. At the end of the 10 years she stopped the IRA payments, but continued to invest her accumulated amount at 8% compounded annually, for the next 30 years.

**a)** What was the value of her IRA investment at the end of 10 years?

**b)** What was the value of her investment at the end of the next 30 years?