PRINCE SULTAN UNIVERSITY

MATH 101 FINITE MATHS

FINAL EXAM 12TH JANUARY 2012

Time Allowed: 2 hours (120 mins)

Name: _____

I.D.: _____

Section: _____

1. Answer all questions.
2. This exam consists of 6 pages including this cover sheet.
3. There are 13 questions. CHECK YOU HAVE ALL THE QUESTIONS.
4. You can use a calculator, NOT a mobile phone.
5. Show all working out in the space provided. If you use the back of a page indicate this on the front.

Question No.	Max. Points	Points Scored
1,2	16	
3,4	20	
5,6	18	
7,8,9,10	18	
11,12,13	28	
TOTAL	100	
TOTAL	40	

1) [6 points] A small company decides to produce video games. The owners find that the fixed cost for creating the game is $5000, after which they must spend $12 to produce each individual copy of the game. Each game is sold for $22. How many games should be sold to break even?

2) [10 points] Solve the following system using matrices:

$$\begin{aligned} x + 2y + 3z - w &= 4 \\ 2x + 3y \quad\quad + w &= -3 \\ 3x + 5y + 3z \quad\quad &= 1 \end{aligned}$$

3) [12 points] Let $A = \begin{bmatrix} 1 & 0 & 1 \\ 2 & -2 & -1 \\ 3 & 0 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & -1 \\ 2 & 2 \\ -4 & 1 \end{bmatrix}$.

a. Find A^{-1}.

b. Find AB.

4) [8 points] Use a sketch to minimize (if possible) $z = 2x + 3y$ subject to:

$$\begin{aligned} x + y &\geq 2 \\ x + y &\leq 10 \\ 2x + 3y &\leq 6 \\ x &\geq 0 \\ y &\geq 0 \end{aligned}$$

5) [8 points] If $U = \text{universal set} = \{0,1,2,3,4,5,6,7,8,9\}$ and $A = \{0,1,5,7\}$ $B = \{2,3,5,8\}$ and $C = \{5,6,9\}$.

a) $A \cup B$

b) $B \cap C$

c) $C \cap \overline{C}$

d) $\overline{A \cap B}$

e) $\overline{A} \cup \overline{B}$

f) $\overline{A} \cap \overline{B}$

g) $A \cup (B \cap A)$

h) $(C \cup A) \cap (\overline{A})$

6) [10 points] A financial advisor maintains a database on his 963 clients and their investments. A search of this database for clients who own stocks in General Motors (**GM**), Ford Motor company (**F**) and Daimler Chrysler (**DCX**) yields the following results :
142 clients own GM
123 clients own F
107 clients own DCX
31 clients own GM and F
25 clients own GM and DCX
19 clients own F and DCX
5 clients own all three

Draw a Venn Diagram to illustrate the situation.

How many clients :
a) Own only GM

b) Neither GM nor F

c) Own GM or DCX, but not F

d) Own GM and DCX, but not F

e) None of these stocks

7) [2 points] A student orders a pizza through a website. He must choose among 4 different crusts, 2 different sizes and 18 different toppings. How many different one-topping pizzas are available?

8) [4 points] A license plate consists of 1 letter excluding the letters O and I, followed by a four-digit number that cannot have 0 in the lead position. How many different plates are possible if repetition is allowed?

9) [6 points] In how many ways can a committee consisting of three faculty members, two administrators and five students be formed if eight faculty members, four administrators and twenty students are eligible to serve on the committee?

10) [6 points] From 8 women and 6 men a committee of 3 is to be formed. The committee must include at least 2 women. In how many ways can this be done?

11) [8 points] Suppose E and F are events of a sample space S for which

$$P(E)=0.7 \qquad P(F)=0.8 \qquad P(E\cap F)=0.5$$

Find:

a) $P(E\cup F)$

c) $P(F|E)$

b) $P(E|F)$

d) $P(\overline{E}|\overline{F})$

12) [4 points] Suppose a yellow die and a green die are thrown. Let event *E* be "Throw a 4 with the yellow die" , and let event F be "Throw 2 with the green die". Show that *E* and *F* are independent events.

13) [16 points] A box contains 11 calculators, of which 5 are defective. All calculators look alike and have equal probability of being chosen. Four calculators are selected and placed in a box.

(a) Find the number of elements in the sample space *S*.

(b) What is the probability that all 4 are defective.

(c) What is the probability that exactly 2 are defective.

(d) What is the probability that at most 2 are defective.