Date: December 27, 2007　　　　　　　**Time: 5:00-7:00 pm**
Instructor Names:

Dr. Ayman Badawi □　　　Dr. Elias Zikkos □　　　Dr. Guillaume Leduc □

Dr. Pany Senevirante □　　　Dr. Yusuf Abumuhanna □

Student Name: _____

Student ID Number: _____　**Time of the Lecture:** _____

1. ***Do not open*** *this exam until you are told to begin.*
2. ***No*** *Questions are allowed during the examination.*
3. *This exam has 18 questions.*
4. *Do not separate the pages of the exam.*
5. *Scientific calculator are allowed but cannot be shared. Graphing Calculators are not allowed.*
6. *Turn off all cell phones and remove all headphones.*
7. *Take off your cap.*
8. *No communication of any kind.*

Student signature: _____

Part I

1. (5 points) A small company manufactures portable home computers. Its cost and revenue functions are:

Cost	$C(x) = 5000 + 1{,}500x$
Revenue	$R(x) = 2{,}000x$

where x is the total number of computers produced and sold each month, and the monthly costs and revenue are in dollars. Find the Break Even Point(s).

2. (5 points) A larger company also manufactures portable home computers. Its cost and revenue functions are:

Cost	$C(x) = 10{,}000 + 500x$
Revenue	$R(x) = x(2000 - 50x)$

where x is in thousands of computers, and the costs and revenue are in thousands of dollars. Find the interval on the x-axis corresponding to a profit.

3. (5 points) Aramex, a package delivery service, charges $30 for shipping a 5-pound package and $90 for shipping a 20-pound package. Assuming the charges per pound, $C(x)$, are linearly related to the weight x in pounds, write a function for the charges $C(x)$. Express $C(x)$ in the form $C(x) = mx + b$.

4. (5 points) A house sells for $300,000. Assuming the inflation is 8% compounded yearly, what would have been the value of that house 4 years ago?

5. (6 points) *[In this question assume a 360-day year]* Sakina purchased a 120-day note with maturity value $5000, which yields 6% of yearly *simple interest*.

a. What is the purchase price of the note?

b. Wishing to be able to use her money sooner, Sakina sells the note to Yassine for $4960 after 60 days. What annual simple interest rate will Yassine receive for his investment?

6. (9 points) A person purchased a $250,000$ home 5 years ago. He paid 20% down and signed a 30-year mortgage at 6% compounded monthly. What is the unpaid balance of the loan (now that 5 years are gone)?

7. (9 points) The manager of an athletic store sells three kinds of running shoes: Reebok, Adidas and Nike. The cost paid by the manager to buy a pair of Reebok is 100 Dhs, for a pair of Adidas it is 200 Dhs, and for a pair of Nike it is 200 Dhs. The profit for these shoes are: Reebok 25 Dhs, Adidas 75 Dhs and Nike 100 Dhs. The manager bought a small shipment for $3,500$ Dhs of these running shoes which will give him a profit of $1,500$ Dhs. How many pairs of running shoes of each kind did he buy? Give two possible solutions. Use Gauss-Jordan elimination method to solve the problem.

8. (4 points) The *initial tableau* of a *Maximization Problem* is

$$\begin{bmatrix} 2 & 2 & 1 & 0 & 0 & 0 & | & 20 \\ -5 & 3 & 0 & 1 & 0 & 0 & | & 3 \\ 5 & -2 & 0 & 0 & 1 & 0 & | & 20 \\ \hline -2 & 8 & 0 & 0 & 0 & 1 & | & 0 \end{bmatrix}$$

a. Find the pivot element for this tableau (put a circle around it)

b. Write down the **Maximization Problem** which is being solved? [In other words: write the maximization problem which produced the above *initial tableau*?]

Part II

9. (2 points) In a group of 42 students, 22 take history, 17 take biology and 8 take both history and biology. *HOW MANY* students take biology but not history?

10. (2 points) Suppose a group of twelve consists of five men and seven women. *HOW MANY* five person teams can be chosen that consists of three men and two women?

11. (2 points) Suppose a group of twelve consists of five men and seven women. *HOW MANY* five person teams can be chosen if Sakina OR Yassine (or possibly both) must be on the committee. [Note: Sakina = female, Yassine = male]

12. (2 points) *HOW MANY* 5-digit ZIP code numbers are possible if the first digit cannot be a four and adjacent digits cannot be the same? [Note the zip code has five digits, the digits are chosen from 0 to 9]

13. (2 points) An experiment consists of rolling two fair dice and adding the dots on the two sides facing up. What is the *PROBABILITY* that the sum of the two numbers on the die will be 4, P(sum of 4)?

14. (2 points) A city council has nine members: five from party A and four from party B. If the President and the Vice President are selected at random, what is the *PROBABILITY* that they are both from party A?

15. (2 points) A city council has nine members: five from party A and four from party B. A 3-person committee is to be selected randomly. What is the *PROBABILITY* that one is from party A and 2 from party B?

16. (2 points) A storeroom contains 60 computers, of which 7 are defective. Ten computers are selected randomly and placed in offices. What is the *PROBABILITY* that at least one is defective?

17. (2 points) A group of 227 college students were given three choices of pizza toppings and asked to choose one favorite. The following table shows the results.

	Freshman	Sophomore	Junior	Senior	Total
Cheese	16	12	22	23	73
Meat	26	23	12	16	77
Veggie	12	16	26	23	77
Total	54	51	60	62	227

a. (2 points) *HOW MANY* of these students are Freshman OR prefer Veggie?

b. (2 points) What is the *PROBABILITY* that a randomly selected student is (junior or senior) and prefers Veggie?

18. (2 points) A bag contains 13 balls numbered 1 through 13. What is the *PROBABILITY* of selecting a ball that has an even number?

Formulas

[1]

$$f(x) = ax^2 + bx + c = 0$$

$$\text{Solution}: \quad x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$\text{Vertex}: \quad (h, k), \text{ where } h = \frac{-b}{2a}, \quad k = f(h)$$

$$I = Prt$$

[2]

$$A = P(1 + rt)$$

[3]

$$A = P(1 + i)^n$$

$$i = \frac{r}{m}$$

$$n = mt$$

[4]

$$FV = PMT\left[\frac{(1 + i)^n - 1}{i}\right]$$

$$PMT = FV\left[\frac{i}{(1 + i)^n - 1}\right]$$

[5]

$$PV = PMT\left[\frac{1 - (1 + i)^{-n}}{i}\right]$$

$$PMT = PV\left[\frac{i}{1 - (1 + i)^{-n}}\right]$$

[6]

$$n(A \cup B) = n(A) + n(B) - n(A \cap B)$$

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

$$P(E) = \frac{n(E)}{n(S)}$$

$$P(E') = 1 - P(E)$$