King Fahd University of Petroleum & Minerals
Department of Mathematical Sciences

Semester I, 2009/2010 (091)

Math 131 – First Major Exam

Date: Nov 3, 2009 *Time: 5:45-7:45 pm*

Name: _____ I.D. # _____ Sec. # _____

QUESTION	GRADE
1	/11
2	/11
3	/11
4	/11
5	/11
6	/11
7	/11
8	/11
9	/11
10	/11
TOTAL	/110

1. A manufacturer produces a product for which the fixed cost is 5,000 SR per month and the variable cost is 6 SR per unit. If 75% of the produced units are sold for 10 SR per unit while the rest is sold at 20% discount, find the number of units that should be produced each year so that the annual profit is 115,000 SR.

2. Suppose consumers will purchase q units of a product at a price of $\frac{1000}{q}+4$ riyals per unit. What is the minimum number of units that must be sold in order that sales revenue is greater than 5000 SR?

3. In one season, a major league football player has score 14 goals by the end of the ninth game and 20 goals by the end of the fifteenth game. Find an equation of the line describing this information.

4. A boy standing in a hill shoots an arrow straight up. The height h of the arrow is described by the function $h(t) = -5t^2 + 20t + 20$, where h is in feet and t in seconds. (a) How many seconds does it take for the arrow to reach the maximum height? (b) What is the maximum height?

5. The value of a new car depreciates at a constant amount per year. If its value after 3 years is 64,000 SR and after 5 years is 60,000 SR, find its initial price.

6. Dealer's Electric makes three kinds of monitors, A, B, and C, which must be manufactured and tested. A requires 3 hours of manufacturing and 1 hour of testing; B requires 4 hours of manufacturing and 2 hours of testing; C requires 6 hours of manufacturing and 2 hours of testing. The company has 285 hours for manufacturing and 115 hours for testing available. Set up the equations and then solve to determine how many of each kind should be made so that a total of 70 monitors are produced?

7. Two friends head from KFUPM to Mecca in their own cars. The distance traveled by the two friends is $s(t) = 5t^2 + 20t + 120$ and $s(t) = 80t + 20$ km in t hours, respectively. The two friends decided that each one of them has to take a rest once every 180 kilometers. When can the two friends have a joint rest?

8. The supply equation for a certain product is $3q - 200p + 1800 = 0$ and the demand equation is $3q + 100p - 1800 = 0$, where p represents the price per unit in riyals and q the number of units sold (per time period).
   (a) Find the equilibrium price.
   (b) Find the equilibrium price when a tax of 0.9 SR per unit is imposed on the supplier.

9. A copy center has to use two copy-machines to make copies of a Math book and a Physics book. The Math book requires two hours on the 1^{st} machine and one hour on the 2^{nd} machine; it can be sold for a profit of 50 SR. The Physics book requires one hour on the 1^{st} machine and two hours on the 2^{nd} machine; it can be sold for a profit of 40 SR. Because of shortage in manpower, the 1^{st} machine cannot be used more than 10 hours per day while the 2^{nd} machine can be used at most 8 hours per day. If all copies produced can be sold, what is the maximum possible daily profit?

   (Set the linear programming problem then solve it geometrically)

10. Suppose a car dealer has showrooms in Dammam and Khobar and storehouses in Dhahran and Doha. The cost of delivering a car from Doha to Dammam is 50 SR, from Doha to Khobar is 35 SR, from Dhahran to Dammam is 60 SR, and from Dhahran to Khobar is 45 SR, The storehouse in Dhahran has 6 cars available and the storehouse in Doha has 8 cars. Suppose the showroom in Dammam orders 7 cars and the showroom in Khobar orders 4 cars. Let x = Number of cars delivered from Dhahran to Khobar and y = Number of cars delivered from Dhahran to Dammam.
    (a) Find the best way to minimize cost.
    (b) Find the minimum cost.
    (Set the linear programming problem then solve it geometrically)