

King Fahd University Of Petroleum & Minerals
Mathematical Sciences Department
Final Exam

Math 131 - Finite Mathematics

January 30, 2010 (091) 7:30-10:30 am

Name _____ ID # _____ Sec. # _____

Calculator can be used

Q1. A company finds that if it produces and sells q units of a product, its total sales revenue in Saudi Riyals is $100\sqrt{q}$. If the variable cost per unit is SR 2 and the fixed cost is SR 1200, then the only values of q for which the company makes no profit are:

- a) 144 and 2500
- b) 400
- c) 400 and 900
- d) 900
- e) 2500

Q2. A marketing firm estimates that n months after the introduction of a client's new product, $f(n)$ thousand households will use it where $f(n) = \frac{10}{9}n(12 - n); 0 \leq n \leq 12$. The maximum number of households that will use the product is

- a) 0
- b) 6 thousand
- c) 12 thousand
- d) 40 thousand
- e) 120 thousand

Q3. 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 35 SR, from Doha to Khobar is 50 SR, from Dhahran to Dammam is 45 SR, and from Dhahran to Khobar is 60 SR. The storehouse in Dhahran has 8 cars available and the storehouse in Doha has 6 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 Dammam and y = Number of cars delivered from Dhahran to Khobar. The linear programming problem to minimize cost Z is:

- Minimize $Z = 8x + 8y + 435$ subject to $x + y \leq 6; y \geq -x + 3$.
- Minimize $Z = 9x - 9y + 440$ subject to $x + y \leq 6; -x - y \leq -3$.
- Minimize $Z = 10x + 10y + 445$ subject to $x + y \leq 8; -x - y \leq -5$.
- Minimize $Z = 11x - 11y + 450$ subject to $x + y \leq 6; y \geq -x + 3$.
- Minimize $Z = 12x + 12y + 455$ subject to $x + y \leq 8; y \geq -x + 5$.

Q4. We use the Simplex method to solve the following linear programming

problem: Maximize $Z = 4x_1 + 5x_2 - 3x_3 - x_4$ subject to

$$\begin{cases} x_1 + x_3 - x_4 \leq 2 \\ x_1 + x_2 + x_4 \leq 5 \\ x_1 + x_2 - x_3 + x_4 \leq 3 \\ x_1, x_2, x_3, x_4 \geq 0 \end{cases}$$

The maximum is

- a) 18
- b) 19
- c) 20
- d) 21
- e) 22

Q5. A debt of SR 1000 due in 3 years and SR 2000 due in 4 years is to be repaid by a single payment 2 years from now. If the interest rate is 8% compounded semiannually, the single payment should be

- a) $1000(1.04)^6 + 2000(1.04)^8$
- b) $1000(1.04)^{-6} + 2000(1.04)^{-8}$
- c) $1000(1.04)^3 + 2000(1.04)^2$
- d) $1000(1.04)^{-2} + 2000(1.04)^{-4}$
- e) $1000(1.04)^{-1} + 2000(1.04)^{-2}$

Q6. For the sample space $\{a, b, c, d, e, f\}$, suppose that the probabilities of a, b, c, d are the same and that the probabilities of e, f are the same. Suppose also that

$$P\{a, e\} = \frac{5}{16}. \text{ Then}$$

- a) $P(a) = \frac{1}{16}$
- b) $P(a) = \frac{2}{16}$
- c) $P(a) = \frac{3}{16}$
- d) $P(a) = \frac{4}{16}$
- e) $P(a) = \frac{5}{16}$

Q7. The probability that person A survives 15 more years is $\frac{2}{5}$ and the probability that person B survives 15 more years is $\frac{2}{3}$. If we assume independence, the probability that neither A nor B survives 15 years is

- a) $\frac{1}{5}$
- b) $\frac{4}{15}$
- c) $\frac{15}{4}$
- d) $\frac{5}{8}$
- e) $\frac{15}{15}$

Q8. In a production process, the probability of a defective unit is $\frac{1}{2}$. Suppose a sample of 5 units is selected at random. Let X be the number of defectives. Then

- a) $P(X \geq 2) = \frac{11}{16}$
- b) $P(X \geq 2) = \frac{5}{16}$
- c) $P(X \geq 2) = \frac{15}{16}$
- d) $P(X \geq 2) = \frac{3}{16}$
- e) $P(X \geq 2) = \frac{13}{16}$

Q9. An owner of 100 apartments can rent 80 of these for 3000 SR per month each. For each 100 SR decrease in the monthly rent, 2 additional apartments can be rented. What monthly rent should be charged to achieve total revenue of 225,000 SR each month?

- a) 2500 SR
- b) 1500 SR
- c) 1800 SR
- d) 2100 SR
- e) 2200 SR

Q10. Suppose that a manufacturer of electric ovens will produce 200 units when the price is 5000 SR and 175 units when the price is 4500 SR. How many units would he produce when the price is 4200 SR?

- a) 160 units
- b) 150 units
- c) 155 units
- d) 165 units
- e) 170 units

Q11. If 10,000 SR are invested at an annual (nominal) rate of 6% compounded semiannually for 2 years, then it will amount to:

- a) 11236 SR
- b) 11255 SR
- c) 10608 SR
- d) 12625 SR
- e) 11265 SR

Q12. The *approximate* number of years needed for any amount of money invested at a nominal rate of 5% compounded continuously to triple is:

- a) 22 years
- b) 15 years
- c) 30 years
- d) 24 years
- e) 25 years

Q13. The sample space of the experiment consisting of throwing a dice two times then a coin three times and noting what appears on the top of the dice and the coin each time, has

- a) 288 elements
- b) 8 elements
- c) 36 elements
- d) 72 elements
- e) 144 elements

Q14. Let E and F be two events such that

$$P(E) = 0.6 \text{ and } P(E \cup F) = 0.8.$$

Then $P(F | E^c) =$

- a) 0.5
- b) 0.2
- c) 0.3
- d) 0.4
- e) 0.6

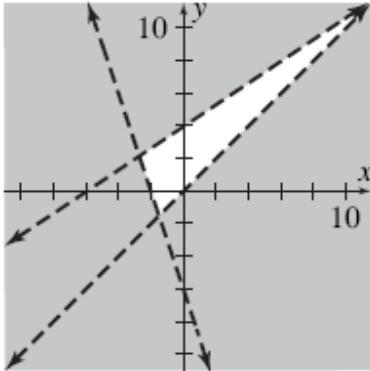
Q15. A biased coin with $P(H) = 0.25$ is tossed 3 times. The probability, rounded to two decimal points, that at least two tails occur is:

- a) 0.84
- b) 0.98
- c) 0.42
- d) 0.67
- e) 0.76

Q16. An automobile factory produces two models. The first model requires 1 hour to paint and $\frac{1}{2}$ hour to polish. The second requires 1 hour for each process. During each hour that the assembly line is operating, there are 100 hours available for painting and 80 hours for polishing. How many of the first model can be produced each hour if all the hours available are to be used.

- a) 70
- b) 60
- c) 50
- d) 40
- e) 30

Q17. The region indicated as white (un-shaded) in the diagram



is described by

a)
$$\begin{cases} 2x - 3y < -12 \\ 3x + y > -6 \\ y > x \end{cases}$$

b)
$$\begin{cases} 2x - 3y > -12 \\ 3x + y > -6 \\ y > x \end{cases}$$

c)
$$\begin{cases} 2x - 3y > -12 \\ 3x + y < -6 \\ y > x \end{cases}$$

d)
$$\begin{cases} 2x - 3y > -12 \\ 3x + y > -6 \\ y < x \end{cases}$$

e)
$$\begin{cases} 2x - 3y < -12 \\ 3x + y < -6 \\ y < x \end{cases}$$

Q18. Transportation. A knitting shop orders yarn from three suppliers in Toronto, Montreal, and Edmonton. One month the shop ordered a total of 100 units of yarn from these suppliers. The delivery costs were \$ 80, \$ 50, and \$ 65 per unit for the orders from Toronto, Montreal and Edmonton, respectively, with total delivery costs of \$ 5990. The shop ordered the same amount from Toronto and Edmonton. Let T , M , and E be the number of units of yarn ordered from Toronto, Montreal and Edmonton, respectively. Then

- a) $M = E + T + 8$
- b) $M = E + T + 10$
- c) $M = E + T + 12$
- d) $M = E + T + 16$
- e) $M = E + T + 20$

Q19. Use the Dual and the Simplex Method to

Minimize $Z = 4x_1 + 5x_2$

$$\text{subject to } \begin{cases} x_1 - x_2 \geq 4 \\ 2x_1 - x_2 \geq 1 \\ 5x_1 + 3x_2 \geq 3 \\ x_1, x_2 \geq 0 \end{cases}$$

Then

- a) Minimum value of $Z = 27$ where $x_1 + x_2 = 6$.
- b) Minimum value of $Z = 16$ where $x_1 + x_2 = 4$.
- c) Minimum value of $Z = 25$ where $x_1 + x_2 = 5$.
- d) Minimum value of $Z = 15$ where $x_1 + x_2 = 3$.
- e) Minimum value of $Z = 36$ where $x_1 + x_2 = 8$.

Q20. If an investment of \$ 12000 earns interest at the annual rate of 7 % compounded continuously, then the value (in dollars) of the investment ten years from now is

- a) $12000(1.07)^{-10}$
- b) $12000(1.07)^{10}$
- c) $(12000)^{-0.7}$
- d) $12000e^{0.7}$
- e) $\frac{e^{0.7}}{12000}$

Q21. A student must select two courses in the liberal arts and three courses in the social sciences. There are six liberal arts courses and ten social science courses, all of which are different, from which the student may choose. How many selections are possible?

- a) 6
- b) 135
- c) 750
- d) 1800
- e) 21600

Q22. An urn contains 20 marbles, each of which shows a number. Eight marbles show 1, five marbles show 2, and seven marbles show 3. A marble is randomly selected and the number X that shows is observed. The mean of X is

- a) 1
- b) $\frac{3}{2}$
- c) $\frac{3}{10}$
- d) $\frac{23}{20}$
- e) $\frac{39}{20}$

Q23. An urn contains 4 red and 3 green marbles. If two marbles are randomly drawn without replacement, find the probability the second one is green, given that the first marble drawn is red.

- a) $\frac{3}{4}$
- b) $\frac{1}{2}$
- c) $\frac{3}{7}$
- d) $\frac{2}{7}$
- e) $\frac{6}{7}$

Q24. The life (in hours) of light bulbs of a certain brand is normally distributed with mean 1000 and standard deviation 100. What percentage of such bulbs will burn more than 950 hours?

- a) 40.95
- b) 72.15
- c) 68.34
- d) 65.54
- e) 69.15