

KARACHI UNIVERSITY BUSINESS SCHOOL
 University of Karachi
FINAL EXAMINATION DECEMBER 2010: AFFILIATED COLLEGES
BASIC MATHEMATICS – I BA (H) 321
BS – I

Instructions:

1. Attempt all questions in sequence/ all questions carry equal marks.
2. Exchange of stationary items/calculators & use of Mobile Phone is strictly prohibited.

Date: Dec 31, 2010 Time: 3 Hours Max. Marks: 60

Q.1(i) Determine the ultimate direction for the function: $f(x) = x^9 - x^7 + x^2 - 1000$

(ii) Evaluate the following:

a) $e^2 = \text{-----}$ b) $\ln e^3 = \text{-----}$ c) $\ln 10,000 = \text{-----}$

(iii) Convert to base "e" functions: $f(x) = (1.6)^x$

(iv) Solve $3^{x+2} = 27$

(v) In the general equation $y = mx + c$; c represents _____

(vi) The slope of a pure vertical line is _____

(vii) Differentiate between simple interest and compound interest

(viii) What is the concavity of the parabola represented by the quadratic function:

(i) $y = x^2 + 2$ (ii) $u = -10v^2 + 9$

(ix) Given $y = g(u) = (u-8)^2$, & $u = h(x) = x^2 + 7$ determine (a) $g(h(x))$

(x) Solve (a) $x^2 \ln x - 4 \ln x = 0$ (b) $\ln(x+1) - \ln x = 0.5$

Q.2. The BeeZee Corporation has purchased an equipment which is expressed by the equation:

$$V = 80,000 - 8500t$$

Where V equals the book value in Rupees and t equals the age of the machine expressed in years.

- (a) Identify the t and V intercepts.
- (b) Identify and Interpret the meaning of the intercepts and the slope.
- (c) Sketch the function

Q.3 (a) A group of technicians has developed a new equipment and estimated that the variable cost per unit is Rs.23. Fixed cost totals Rs.125,000. They estimate that the selling price per unit equals Rs.50. (a) Determine the number of units which must be sold in order to break-even on the venture (b) The marketing data indicates that approximately 20,000 units may be sold, determine the expected profit at this level of output.

Q.3 (b) Sketch the quadratic function: $f(x) = 6x^2 + x - 12$

Q.4(a) A major airline is planning to purchase new airplanes. It wants to borrow Rs 800 million by issuing bonds. The bonds are for a 10 year period with simple interest computed quarterly at a rate of 2 percent per quarter. Interest is to be paid each quarter to bondholders. How much will the airline have to pay in quarterly interest? How much interest will it pay over the 10 year period

Q.4 (b) If $A = \begin{bmatrix} 5 & 2 \\ 6 & 4 \end{bmatrix}$ **and** $B = \begin{bmatrix} 2 & 1 \\ 7 & 3 \end{bmatrix}$

Determine the following:

- i. The respective dimensions of both the matrices.
- ii. $(A+B)$ and $(B-A)$
- iii. AX and BXA
- iv. Determinant of Matrix A and Matrix B

Q.5.(a) A person recently won a lottery. The terms of the lottery are that the winner will receive annual payments of Rs20, 000 at the end of this year and each of the following 3 yrs. If the winner could invest money today at the rate of 8 percent per year compounded annually what is the present value of the four payments.

Q.5.(b) The population (P) in millions of a city is estimated by the function of time (t) measured in years since year 2000. $P = 1.2 e^{0.045t}$

- (i) What is the population expected to equal in 2010
- (ii) Determine the general expression for the instantaneous rate of change in the value of P .
- (iii) What is the instantaneous rate of P at $t = 10$ and interpret it.

KARACHI UNIVERSITY BUSINESS SCHOOL
University of Karachi
FINAL EXAMINATION JUNE 2010; AFFILIATED COLLEGES
BUSINESS MATHEMATICS – I BA (H) – 321

**BS FOUR YEARS
PROGRAM**

BS – I

Date: June 20, 2010
Instructions: Attempt all questions

Max Time: 3 Hrs
Max Marks: 60

Q1. Define the following

- | | |
|--|-------------------------------|
| i. A Function | ii. Domain of a function |
| iii. Range of a function | iv. Mid point formula |
| v. Distance formula | vi. Slope of a line |
| vii. Slope of a line passes through two points | viii. Differentiable function |
- if U and V are function of x then write f'(x) if
- | | |
|------------------|-------------------------|
| ix. $f(x) = U.V$ | x. $f(x) = \frac{U}{V}$ |
|------------------|-------------------------|

- Q2. (a)** Find the equation of line perpendicular to line $3x + 7y = 5$ and passes through the midpoint of A (5,7), B (-1, 1)
- (b)** Determine the equation of the quadratic function which passes through the points (1, -1), (-3, -33) and (2, -8)

Q3. (a) Solve the system using Gaussian elimination Method

$$2x_1 - x_2 + 3x_3 = 3$$

$$3x_1 + x_2 - 5x_3 = 0$$

$$4x_1 - x_2 + x_3 = 3$$

- (b)** If $y = g(u) = 2u - 5$ and $u = h(x) = x^2 - 3x + 6$. Determine (i) $g(h(x))$, (ii) $g(h(-2))$
(iii) $g(h(5))$

Q4. (a) Determine domain of $f(x) = \sqrt{6x^2 + x - 12}$

- (b)** The salary of a sale person depends upon commission on each unit sold of three different Products and a base salary per week. The base salary is Rs. 600 and commissions per unit sold are Rs. 25, 40, 30 respectively. Determine.

- i. Salary function
- ii. What would be salary if 20, 35, 15 unites resp. are sold
- iii. Assume that the sale person can earn a bonus if combined sale for the 3 products exceeds by 50 units for the week and the bonus equal to Rs 25 plus Rs 1.25 additional commission for all units sold in excess of 50. Determine now the weekly salary function and now what would be earned for 20, 35 and 15 units sold.

Q5. (a) Solve $8x^2 \ln x - 6x \ln x = 9 \ln x$

- (b)** A sum of Rs. 800, 000/= is invested with the interest rate 8% per year. What will be amount after 10 years if interest is calculated.

- (i) Compound annually
- (ii) Compound semi annually
- (iii) Compound quarterly
- (iv) Compounded continuously

17756

FOUR YEARS PROGRAM

Q.1(a)

Q.2(a)

provision of... food and other... by means of...
airplanes...
containers...
plane will be loaded to its...
plane to one empty item only...
item

Q.2(b)

- (i) Wh...
- (ii) Com...
- (iv) Re...
- (v) De...

Q.3(a) Solve the

Q.3(b) A blending

final... and 51.25...
per gallon...
Another...
component... Determine whether...
there is a combination... which will lead to a final blend of...
60,000 gallons... blending restrictions.

Q.4(a) (i) Determine the... $\frac{h^2-4}{(h^2+h^2-6h)}$

(ii) Given $f(x) = x^2 - 3$ and $g(x) = 10 - 2x$, determine $f(x) + g(x)$ & $f(x).g(x)$

✓ Q.4(b) A manufacturer offers a wage incentive to persons who work on one particular product. The standard time to complete one unit of the product is 15 hrs. Laborers are paid at the rate of Rs.8 per hr up to a maximum of 15 hrs for each unit of the product. If a unit of the product requires more than 15 hrs, the laborer is only paid for the 15 hrs the unit should have required. The manufacturer has built in a wage incentive for completion of a unit in less than 15 hrs. For each under the 15 hr standard the hourly wage for a worker increases by Rs.1.5. Assume that the 1.5 per hr incentive applies to any incremental savings including fractions of an hr. Determine the function $w = f(n)$, where w = the hourly wage rate in rupees and n = the number of hrs required to complete one unit of the product.

✓ Q.5(a) A firm has two equipment alternatives it can choose from in producing a new product. One automated piece of equipment costs Rs.200,000 and produces items at a cost of Rs.4 per unit. Another semi automated piece of equipment costs Rs.125,000 and produces items at a cost of Rs.5.25 per unit (a) What volume of output makes the two pieces of equipment equally costly (b) If 80,000 units are to be produced, which piece of equipment is less costly? What is the minimum cost?

✓ Q.5(b) For the function $f(x) = 450x^2 - 19,600x + 241,600$ determine:

- i. The degree of the function
- ✓ ii. Classification of function by type
- ✓ iii. Ultimate direction of the function
- ✓ iv. Concavity of the function
- v. Co-ordinates of the vertex

✓ Q.6(a) For a particular prescription drug half of the amount of the drug in the bloodstream is excreted by the kidneys every 4 hrs. Given an initial dosage of 300mg (i) Determine the function $A = f(t)$ where A equals the amount of the drug in the bloodstream (in mg) and t equals time since the dosage was administered measured in increment of 4 hours. (ii) What amount is in the system after 8 hrs, after 10hrs, after 24 hrs

✓ Q.6(b) A person plans to deposit Rs.1,000 in a tax-exempt savings plan at the end of this year and an equal sum at the end of each following year. If interest is expected to be earned at the rate of 6% per year compounded annually, to what sum will the investment grow at the time of the fourth deposit.

✓ Q.7(a) Solve the following system of equation by Cramer's rule: $-x_1 + 2x_2 = -4$
 $4x_1 - 8x_2 = 18$

Q.7(b) Determine $f'(x)$ for the following:

(i) $f(x) = (1 - 4x^3)^5$

(ii) $f(x) = e^x$

(iii) $f(x) = \ln x / e^{x^2}$

University of Karachi
Department of Business Administration

BS-I

Final Examination: Affiliated Colleges
BASIC MATHEMATICS – I (BA(H) 321)

Instructions: Attempt SIX questions / all questions carry equal marks, use of mobile phone/digital diary is restricted, Financial tables of any kind shall not be provided.

Dated: Jun 14, 2008 Time: 3 hrs Max. Marks: 60

Q.1. Solve the Following:

- i. $2\sqrt{x}=4$
- ii. $3x^2+1=10$
- iii. $1/(p+1) + 1/(p+2) = 1/3$
- iv. $|x-8|=6$
- v. $|10-2x|=x+5$
- vi. $|x|=-123.015$
- vii. Find the midpoint of the line segment connecting the points (-2,-4) and (2,4)
- viii. Find the distance separating the points (3,-2) and (-3,5)
- ix. A and B have Rs.80 together and 1/5 of A's money is equal to 1/3 of B's money. How much do each have?
- x. The sum of three numbers in an arithmetic progression is 30 and the product of the extremes is 96. Find the numbers.

Q.2. (a) An International NGO is making plans to airlift emergency food and medical supplies into a large city which has recently suffered from severe flooding. The four items and their respective volumes per container are shown in the table. The first plane to be sent into the area has a volume capacity of 6000 cubic feet. Determine an equation whose solution set contains all possible combinations of the four items which will fill the plane to its volume capacity.

Item	Volume/container (ft ³)
Blood	20
Medical supply kits	30
Food	8
Water	6

Q.2. (b) A student is taking five courses and is facing the crunch of final exams. He estimates that he has 40 hours available to study. If x_j = the number of hours allocated to studying for course j, state the equation whose solution set specifies all possible allocations of time among the five courses which will exhaust the 40 hours available.

Q.3. (a) Determine the solution set using Gaussian elimination method. For any system having infinitely many solution specify generalized form of the solution:

$$-x + 2y = -8$$

$$3x - 6y = 24$$

Q.3. (b) Determine the solution set for the given system:

$$\begin{aligned} 2x_1 - 4x_2 - 2x_3 &= 6 \\ -x_1 + 2x_2 + 3x_3 &= 9 \end{aligned}$$

Q.4. A manufacturer offers a wage incentive to persons who work on one particular product. The standard time to complete one unit of the product is 15 hrs. Laborers are paid at the rate of Rs.8 per hr up to a maximum of 15 hrs for each unit of the product. If a unit of the product requires more than 15 hrs, the laborer is only paid for the 15 hrs the unit should have required. The manufacturer has built in a wage incentive for completion of a unit in less than 15 hrs. For each hour under the 15 hr standard the hourly wage for a worker increases by Rs.1.5. Assume that the 1.5 per hr incentive applies to any incremental savings including fractions of an hr. Determine the function $w = f(n)$, where w = the hourly wage rate in rupees and n = the number of hrs required to complete one unit of the product.

Q.5. Given the following demand and supply functions for the two competing products,

$$Q_{d1} = 82 - 3p_1 + p_2$$

$$Q_{s1} = 15p_1 - 5$$

$$Q_{d2} = 92 + 2p_1 - 4p_2$$

$$Q_{s2} = 32p_2 - 6$$

Determine whether there are prices which bring the supply and demand levels into equilibrium for the two products. If so, what are the equilibrium quantities?

Q.6. (a) Assume that a manufacturer can purchase a needed component from a supplier at a cost of Rs.9.50 per unit, or it can invest Rs.60,000 in equipment and produce the item at a cost of Rs.7.00 per unit. Determine the quantity for which total cost are equal for both the alternatives.

(b) The population P of a large city has been growing exponentially at a constant rate of 2.5 percent per year. The population on January 1, 2006, was 40 million.

1. Write the general exponential growth function $P=f(t)$ for the population of the city, where t equals time measured in years since January 1, 2006.
2. If the rate and pattern of growth continue, what is the population expected to equal at the beginning of 2010? In the beginning of the year 2015?

Q.7. (a) A person wishes to invest Rs.10,000 and wants the investment to grow to Rs. 20,000 over the next 10 years. At what annual interest rate would the Rs. 10,000 have to be invested for this growth to occur, assuming annual compounding?

(h) If $A = \begin{bmatrix} 2 & 4 \\ 3 & 6 \end{bmatrix}$ $B = \begin{bmatrix} 1 & 3 \\ 5 & 2 \end{bmatrix}$

Find $2A+B$, $3B-A$, Determinant of A and Determinant of B

(c) Find all higher order derivatives

(i) $f(x) = 16x^3 - 4x^2$ (ii) $f(x) = 2400$ (iii) $f(x) = e^x$

University of Karachi
Department of Business Administration
BBA-I

Final Examination: Affiliated Colleges
BASIC MATHEMATICS – I (BA(H) 321)

Instructions: Attempt all questions / all questions carry equal marks, use of mobile phone/digital diary is restricted.

Dated: Jun 18, 2007 Time: 3 hrs Max. Marks: 60

Q.1(a) Calculate the following:

- i. $(x^{-1}, x^{-2}) / x^{-3}$
- ii. $y^2 - 3y^2 + 2y^5 + 4xy$
- iii. $(x^2 + 4x + 4) / (x + 2)$
- iv. $(p^2 - 2p + 1) \cdot (p + 1)$
- v. Find "x" for the proportion; 2:4::5:x

Q.1(b) (i) Express 1/7 in terms of percentage

(ii) Change 3/5 % to decimal

(iii) A firm manufactures a product and sells it at a profit of 15% of the cost price. If the cost price is Rs.300 per unit, determine the price at which the firm sells the product in the market.

(iv) In a joint venture business, three partners have invested in the ratio 3:4:5, the profit earned by the business is Rs.500,000. Determine the profit share of each partner.

(v) Classify the following functions (by type)

(a) $\sqrt{t^2 + 2t + 4}$ (b) $k + 5$ (c) 1004 (d) $(\sqrt{x^2}/x)$ (e) $1/(9x + 2)$

Q.1(c) What is the concavity of the parabola representing each quadratic function:

(i) $y = 2x^2 + 15$ (ii) $u = -16v^2 + 5$ (iii) $y = 4x^2 + 10x + 2$ (iv) $y = 2x^2 - 20x + 10$

Q.2(a)

(i) On the line passing through (2,3) and (-5,6), what is the 'y' co-ordinate of the point where $x = 17$

(ii) What is the slope of any line parallel to the given line

(iii) What is the slope of any line perpendicular to the given line

(iii) Find the equation of a line parallel to and 5 units above x-axis.

Q.2(b) Determine the solution set for the following system of equations:

$$\begin{aligned} x + 2y &= 8 \\ 2x - 3y &= -5 \\ -5x + 6y &= 8 \\ x + y &= 7 \end{aligned}$$

Q.3 (a) Solve the following:

(i) $2x - 5 \geq 3x + 2$ (ii) $4x - 4 \leq x \leq 2x - 10$ (iii) $x^2 - 5x + 6 \leq 0$ (iv) $|x| = -53$ (v) $|5 - 3x| = |-2x + 7|$

Q.3(b). Solve the following system of equation using Cramer's rule

$$\begin{aligned}x_1 - 5x_2 &= -85 \\ 2x_1 + 4x_2 &= 40\end{aligned}$$

Q.4.(a) Sketch the quadratic function $f(x) = 3x^2 + 6x - 45$

(b) Determine the ultimate direction for the function:

(i) $f(x) = x^9 - x^7 + x^2 - 1000$ (ii) $f(x) = -(x^3 - 2)^4$

(c) Evaluate the following:

i. $e^2 = \dots$ ii) $\ln e^3 = \dots$ iii) $\ln 10,000 = \dots$ iv) solve $3e^{-0.5x} = 10$

Q.5.(a) For a particular prescription drug half of the amount of the drug in the bloodstream is excreted by the kidneys every 4 hrs. Given an initial dosage of 300mg Determine the function $A=f(t)$ where A equals the amount of the drug in the bloodstream (in mg) and t equals time since the dosage was administered measured in increment of 4 hours. (b) What amount is in the system after 8 hrs, after 10hrs

Q.5(b) A ball thrown upwards from the roof of a building which is 600 feet high will be at a height of 'h' feet after 't' seconds, as described by the function:

$$h = f(t) = -16t^2 + 50t + 600$$

- What is the height of the ball after 3 seconds
- What is the velocity of the ball after 3 seconds
- What is the acceleration of the ball at $t = 0$? At $t = 5$?

Q.6(a) A radioactive substance has a decay constant $k=0.350$. If t is measured in hrs, determine the half-life for the substance. What is the quarter life (time to reduce the amount by $\frac{1}{4}$)?

Q.6(b) Convert the following to base "e" exponential function:

(i) $f(x) = (2)^x$ (ii) $f(t) = 10(0.3)^t$

Q.6(c) Determine the limit for:

(i) $\lim_{x \rightarrow 2} \frac{x^3 - 1}{x^2}$

(ii) $\lim_{x \rightarrow -4} \frac{x^2 - 16}{x + 4}$

(iii) $\lim_{x \rightarrow 3} 2x$

University of Karachi
Department of Business Administration
BBA (First Year First Semester)
Final Examination: Affiliated Colleges
BUSINESS MATHEMATICS - I (BA(P) 341)

Instructions: Attempt all questions / all questions carry equal marks, use of mobile phone/digital diary is strictly prohibited.

Max. Marks. 60

Jun 18, 2007

Time: 3 Hrs

Instruction: Attempt all questions. Attempt the questions in sequence. Exchange of any stationary items and use of mobile phone is strictly prohibited.

Q-1. (a). Solve the following system of equations and make conclusions about the result.

$$3x - 2y = 6$$

$$-15x + 10y = -30$$

(b). Solve the following equation

(i) $|x + 8| = 5$

(ii) Given the points $(-4, 8)$ and $(6, -12)$

- Determine the midpoint of the line segment connecting the point.
- Determine the distance separating the two points.
- Determine the equation of straight line, which passes through the two points.
- Identify the slope, y intercept, and x intercept.

(c) Classify the following function as Quadratic, Exponential, Linear etc:
 $f(x) = 5x + 7$, $f(x) = x^4 + 10x^3 + 5x^2 + 15$, $f(t) = \ln(t^2 + 5)$, $f(z) = 3^{2z}$

(d) What is the concavity of the parabola of the given quadratic functions:
 $Y = 9x^2$, $Y = -10x^2 + 60$, $Y = x^2 + 45x$

Q.2.(a) The head of Human Resource has been given a budget allotment of Rs.500, 000 to staff an engineering department. Four types of employees are needed: senior engineers at an annual salary of Rs.60, 000 each, Junior engineers at an annual salary of Rs.32, 500 each, drafters at an annual salary of Rs.20, 000 each, and secretaries at a salary of Rs.15, 000 each. Write an equation whose solution set contains the possible combinations of employees, which could be hired for Rs.500, 000.

Q.2.(b) The function $V = f(t) = 36,000 - 4500t$ states that the value of a piece of equipment is a function of its age. V equals the value in rupees and t equals the age of the equipment in years. Determine the restricted domain and range for this function and also interpret the V-intercept and t-intercept.

Q.3(a). Determine the inverse of the (3×3) matrix.

$$\begin{bmatrix} 5 & 2 & -3 \\ 8 & 6 & -1 \\ -2 & 6 & 3 \end{bmatrix}$$

Q.3(b). Solve the following system of equation using Cramer's rule

$$\begin{aligned}x_1 - 5x_2 &= -85 \\ 2x_1 + 4x_2 &= 40\end{aligned}$$

Q.4.(a) Sketch the quadratic function $f(x) = 3x^2 + 6x - 45$

(b) Determine the ultimate direction for the function:

(i) $f(x) = x^9 - x^7 + x^2 - 1000$ (ii) $f(x) = -(x^3 - 2)^4$

(c) Evaluate the following:

i. $e^2 = \text{-----}$ ii) $\ln e^3 = \text{-----}$ iii) $\ln 10,000 = \text{-----}$ iv) solve $3e^{-0.5x} = 10$

Q.5.(a) For a particular prescription drug half of the amount of the drug in the bloodstream is excreted by the kidneys every 4 hrs. Given an initial dosage of 300mg Determine the function $A=f(t)$ where A equals the amount of the drug in the bloodstream (in mg) and t equals time since the dosage was administered measured in increment of 4 hours. (b) What amount is in the system after 8 hrs, after 10hrs

Q.5(b) A ball thrown upwards from the roof of a building which is 600 feet high will be at a height of 'h' feet after 't' seconds, as described by the function:

$$h = f(t) = -16t^2 + 50t + 600$$

- What is the height of the ball after 3 seconds
- What is the velocity of the ball after 3 seconds
- What is the acceleration of the ball at $t = 0$? At $t = 5$?

Q.6(a) A radioactive substance has a decay constant $k=0.350$. If t is measured in hrs, determine the half-life for the substance. What is the quarter life (time to reduce the amount by $\frac{1}{4}$)?

Q.6(b) Convert the following to base "e" exponential function:

(i) $f(x) = (2)^x$ (ii) $f(t) = 10(0.3)^t$

Q.6(c) Determine the limit for:

(i) $\lim_{x \rightarrow 2} \frac{x^3 - 1}{x^2}$

(ii) $\lim_{x \rightarrow -4} \frac{x^2 - 16}{x + 4}$

(iii) $\lim_{x \rightarrow 3} 2x$

University of Karachi
Department of Business Administration
BBA (First Year First Semester)
Final Examination: Affiliated Colleges
BUSINESS MATHEMATICS – I (BA(P) 341)

Instructions: Attempt all questions / all questions carry equal marks, use of mobile phone/digital diary is restricted.

Dated: Dec 05, 2006 Time: 3 hrs Max. Marks: 60

Q.1(a) Solve the following :

- i. $4x+9 \geq 4x-2$
- ii. $-3x+2 \leq x \leq 8-x$
- iii. $4x^2-100 < 0$
- iv. $8-2x=x+4$
- v. $|x| = -103$

Q.1(b) Solve the following inequalities: (illustrate using number line)

- i. Convert to base e functions: (a) $f(x) = (1.6)^x$ (b) $f(u) = (0.6)^u (1.6)^{2u}$
- ii. Solve $e^{0.08p} = 2$
- iii. $3e^{-2x} = 75$

Q.1(c) Given the points $(-4, 8)$ and $(6, -12)$

- (i) Find the lengths and midpoints of the line segments.
- (ii) What is the slope of any line parallel to the given line
- (ii) What is the slope of any line perpendicular to the given line
- (iii) Find the equation of a line parallel to x-axis and which passes through $(1, 4)$

Q.2(a) The City Station Hospital has purchased a machine which is expressed by the equation:

$$V = 80,000 - 8500t$$

Where V equals the book value in Rupees and t equals the age of the machine expressed in years.

- (a) Identify the t and V intercepts.
- (b) Interpret the meaning of the intercept.
- (c) Interpret the meaning of the slope.
- (d) Sketch the function

Q.2(b) Classify the following functions (according to types) and also determine the domain:

- (i) $\sqrt{x^2 + 2x + 14}$ (ii) $t+5$ (iii) $\frac{35}{(x^2-100)}$ (iv) $(\sqrt{x^2}/x)$ (v) $1/(9x+2)$

Q.3 (a) A group of technicians has developed a new equipment and estimated that the variable cost per unit is Rs.23. Fixed cost totals Rs.125,000. They estimate that the selling price per unit equals Rs.50. (a) Determine the number of units which must be sold in order to break-even on the venture (b) The marketing data indicates that approximately 20,000 units may be sold, determine the expected profit at this level of output.

Q.3(b) What is the concavity of the parabola representing each quadratic function:
 (i) $y = x^2 + 12$ (ii) $u = -10v^2 + 6$ (iii) $y = 4x^2 + 10x + 2$ (iv) $y = 2x^2 - 20x + 10$

Q.3 (c) Sketch the quadratic function: $f(x) = 6x^2 + x - 12$ (Employ x , y intercepts and vertex co-ordinates)

Q.4.(a) A gas station sells unleaded regular gasoline and unleaded premium. The price per gallon charges by the station is Rs. 1.299 for unleaded regular and Rs. 1.379 for unleaded premium. The cost per gallon from the supplier is Rs. 1.219 for unleaded regular and Rs. 1.289 for premium. If x_1 equals the number of gallon sold of regular and x_2 the number of gallons sold of premium.

- Formulate the revenue function from selling x_1 and x_2 gallons, respectively, of two grades of gasoline.
- Formulate the total cost function from purchasing x_1 and x_2 gallons, respectively, of the two grade.
- Formulate the total profit function.

Q.4.(b) Given $y = g(u) = (u-5)^2$, & $u = h(x) = x^2 + 1$ determine (a) $g(h(x))$ (b) $g(h(5))$

Q.5(a). i) $3\ln 2x - 4 = 2\ln 2x$ ii) $\ln(x+1) - \ln x = 0.5$ (iii) $x^2 \ln x - 4\ln x = 0$

Q.5(b). A ball thrown upwards from the roof of a building which is 600 feet high will be at a height of h feet after t seconds, as described by the function $h = f(t) = -16t^2 + 50t + 600$

- What is the height of the ball after 3 seconds
- What is the velocity of the ball after 3 seconds
- What is the acceleration of the ball at $t = 0$? At $t = 5$?

Q.5(c) Determine the limit for the function

(a) $\lim_{x \rightarrow \infty} 4/x$

(b) $\lim_{x \rightarrow 4} [(x^2 - 5)(x+1)]$

(c) Find the indicated limit and comment on the existence of any asymptotes for the function $\lim_{x \rightarrow \infty} -3x / (5x + 100)$

(d) Determine whether the function is continuous or discontinuous for $f(x) = (2x+3) / 2$

Q.6.(a) Determine the inverse of the (3×3) matrix.

$$\begin{bmatrix} 4 & 1 & -2 \\ 2 & 5 & -1 \\ -6 & 7 & 3 \end{bmatrix}$$

Q.6 (b) Solve the following system of equation using Cramer's rule

$$\begin{aligned} x_1 - 5x_2 &= -85 \\ 2x_1 + 4x_2 &= 40 \end{aligned}$$

Q.6 (c) If $A = \begin{bmatrix} 1 & 5 \\ 4 & 3 \end{bmatrix}$ & $B = \begin{pmatrix} 1 & 2 & 0 \\ 1 & 0 & -1 \\ -1 & 3 & 2 \end{pmatrix}$

Determine the following whichever possible: $A+B$, $B-A$, AxB , BxA

University of Karachi
Department of Business Administration
BBA (First Year First Semester)
Final Examination: Affiliated Colleges
BUSINESS MATHEMATICS – I (BA(P) 341)

Instructions: Attempt all questions / all questions carry equal marks, use of mobile phone/digital diary is restricted.

Dated: June 12, 2006 Time: 3 hrs Max. Marks: 60

Q.1(a) Solve the following equation:

i. $(t-3)/2 + (t+3)/4 = (8-t)/3 + 2$

ii. $3\ln 2x - 4 = 2\ln 2x$

iii. $65 = \sqrt{x} + 1/\sqrt{x}$

Q.1(b) Solve the following inequalities: (illustrate using number line)

i. $15 < x+5 < 40$

ii. $x^2 - 5x + 6 < 0$

iii. $x^2 - 2 > 2$

Q.1(c) The co-ordinates of the vertex of a triangle are A (0, 0), B (5, 0) and C (5, 5).

i. Find the lengths and midpoints of the line segments AB, BC and AC respectively:

Q.2(a) Determine the domain of the function (i) $f(t) = \sqrt{9-t^2}$ (ii) $g(h) = \sqrt{h^2-4}/h^3 + h^2 - 6h$

Q.2(b) Classify the following functions according to types:

(i) $(x+2)/\sqrt{x^2+4x+4}$ (ii) $2^0/2^x$ (iii) 3^{2x} (iv) $\sqrt{x^2}/x$

Q.2 (c) Consider the Linear Equation $3x - 6y = 24$, and determine the following:

(i) What is the slope of any line parallel to the given line

(ii) What is the slope of any line perpendicular to the given line

(iii) Find the equation of a line parallel to x-axis and which passes through (2, 5)

Q.3 (a) A manufacturer offers a wage incentive to persons who work on one particular product. The standard time to complete one unit of the product is 15 hrs. Laborers are paid at the rate of Rs.8 per hr up to a maximum of 15 hrs for each unit of the product. If a unit of the product requires more than 15 hrs, the laborer is only paid for the 15 hrs the unit should have required. The manufacturer has built in a wage incentive for completion of a unit in less than 15 hrs. For each hour under the 15 hr standard the hourly wage for a worker increases by Rs.1.5. Assume that the 1.5 per hr incentive applies to any incremental savings including fractions of an hr. Determine the function $w = f(n)$, where w = the hourly wage rate in rupees and n = the number of hrs required to complete one unit of the product.

Q.3 (b) Given $c=h(s)=s^2-8s+5$ and $s=f(t)=10$, determine (a) $h(f(t))$ (b) $h(f(3))$ (c) $h(f(-2))$

Q.4 (a) A car rental agency leases automobiles at a rate of Rs.300 per day plus Rs.30 per mile driven. If y equals the cost in rupees of renting a car for one day and x equals the number of miles driven in one day: Determine the function $y = f(x)$ which expresses the daily cost of renting a car.

Q.4.(b) Sketch the following function.

$$f(x) = \begin{cases} 4 & x \leq -2 \\ |x| & -2 < x < 2 \\ -4 & x \geq 2 \end{cases}$$

Q.5(a). The poultry industry is suffering from the Bird flu epidemic and the number of chickens expected to be afflicted by this disease is estimated by the function $P = f(s) = 0.05s^3 + 2$ where P = number of chickens afflicted and s = number of days since the disease was first detected. How many chickens are expected to be afflicted after (a) one month (ii) after 25 days (assume 1 month = 30 days)

Q.5(b). A non-profitable welfare organization is planning a raffle to raise Rs.300,000. Five hundred chances will be sold on a new car. The car will cost the organization Rs.150,000. How much should each ticket cost if the organization wishes to net a profit of Rs.300,000.

Q.6(a) For a particular prescription drug half of the amount of the drug in the bloodstream is excreted by the kidneys every 4 hrs. Given an initial dosage of 300mg
(a) Determine the function $A = f(t)$ where A equals the amount of the drug in the bloodstream (in mg) and t equals time since the dosage was administered measured in increment of 4 hours. (b) What amount is in the system after 8 hrs, after 10hrs

Q.6 (b) A radioactive substance has a decay constant $k=0.350$. If t is measured in hrs, determine the half-life for the substance. What is the quarter life (time to reduce the amount by $\frac{1}{4}$)?

Q.7 (a) Solve the following system of equation using Cramer's rule

$$x_1 + 3x_2 - 2x_3 = 17$$

$$2x_1 - 4x_2 + x_3 = -16$$

$$5x_1 + 2x_2 - 4x_3 = 21$$

$$\frac{1}{2} P_0 = P_0 e^{-kt}$$

$$\frac{1}{2} = e^{-0.35t}$$

$$\ln \frac{1}{2} = -0.35t$$

Q.7 (b) Determine the inverse of the (3×3) matrix.

$$B = \begin{pmatrix} 1 & 2 & 0 \\ 1 & 0 & -1 \\ -1 & 3 & 2 \end{pmatrix}$$

Q.7 (c) Given $A = \begin{pmatrix} 5 & 3 & 2 & 6 \\ 1 & 2 & 1 & 8 \\ 4 & 5 & 4 & 3 \end{pmatrix}$, $B = \begin{pmatrix} 3 & 2 & 6 \\ 2 & 1 & 8 \\ 5 & 4 & 3 \end{pmatrix}$

Find AB and BA (whichever possible)