



Terminal Examination – Semester Spring 2017

Course Title:	Calculus and Analytic Geometry	Course Code:	MTH104	Credit Hours:	3(3,0)
Course Instructors:	Dr. Hani Shaker, Dr. Kashif Nazar, Dr. Abdul Jawad, Dr. Aqeel Ahmad Khan, Dr. Shamaila Rani, Dr. Faisal Nadeem, Dr. Rabia Saleem, Mr. Maqsood Ahmad, Ms. Shazia Rana.	Programs:	BCS, BSE		
Semester:	Batch: FA-16, SP-17	Section:	All	Date:	22-06-17
Time Allowed:	3 Hours	Maximum Marks:	100		
Student's Name:		Reg. No.:	CIIT-	/LHR	

Important Instructions / Guidelines: Attempt all questions.**Question 1:**

(10, 10)

- (a) Find the limit of the function by using the properties.

$$\lim_{x \rightarrow 1} \left(\frac{1}{\sqrt{x}} \right) - 1$$

- (b) Is the function

$$f(x) = \begin{cases} \frac{2x^2 + 3x + 1}{x + 1} & \text{if } x \neq -1 \\ 3 & \text{if } x = -1 \end{cases}$$

continuous at $x = -1$?**Question 2:** (a) Determine the intervals on which the function

(10+10)

$$f(x) = \frac{(x+1)(x-2)}{(x+3)(x-4)}$$

is positive or negative.

- (b) Find the equations of the tangent and normal lines to the graph of the implicit function determined by the following equations at the given point.

$$x^3 - 3xy^2 + y^3 = 1 \quad \text{at } P(2, -1)$$

(10+10)

Question 3:

- (a) Sketch the graphs of the two equations, find the points of intersection of the two graphs, and find the area of the region bounded by the two graphs.

$$f(x) = -x^2 + 4x \quad \text{and} \quad g(x) = x^2$$

- (b) Find the arc length of the graph of
- $y = \frac{x^3}{6} + \frac{1}{2x}$
- between the points
- $\left(1, \frac{2}{3}\right)$
- and
- $\left(3, \frac{14}{3}\right)$
- .

Question 4:

(10+10)

- (a) Use repeated integration by parts to evaluate following integral.

$$\int x^2 e^x dx$$

- (b) Evaluate following limit

$$\lim_{x \rightarrow 1} \frac{\ln(x) - \sin(x-1)}{(x-1)^2}$$

Question 5:

(5+5+10)

- (a) Show that the series

$$\sum_{k=1}^{\infty} \frac{e^k}{3e^k + 7}$$

diverges by showing that the general term does not approach zero.

- (b) Apply suitable test to determine whether the series

$$\sum_{k=1}^{\infty} \left(\frac{7k}{5k+1} \right)^k$$

converges or diverges

- (c) Determine whether the series

$$\sum_{k=1}^{\infty} \frac{(-1)^k 5^k}{k \cdot 4^k}$$

absolutely converges or diverges.