



COMSATS University Islamabad  
Attock Campus



Department of Mathematics

Assignment # 03

Class: BCS (3<sup>rd</sup>)  
Subject: Calculus and Analytic Geometry  
Instructor: Dr. Atiq ur Rehman

Due Date: 19-11-2024 (1120PST)  
Course Code: MTH104  
Marks: 20

Name: \_\_\_\_\_

Reg: FA23-BCS-\_\_\_\_\_

Question # 1: Give the answer to the following:

(i)  $\lfloor \sqrt{2} \rfloor =$  \_\_\_\_\_

(iii)  $\lceil e^2 \rceil =$  \_\_\_\_\_

(ii)  $\lfloor -3.99 \rfloor =$  \_\_\_\_\_

(iv)  $\left\lceil -\frac{1}{\pi^3} \right\rceil =$  \_\_\_\_\_

Question # 2: Write the kind of the integral; proper, 1st kind, 2nd kind or mixed kind.

(i)  $\int_0^1 \frac{1}{x} dx$  : \_\_\_\_\_

(v)  $\int_0^4 e^{-x} \tan x dx$  : \_\_\_\_\_

(ii)  $\int_1^{\infty} \frac{1}{x-1} dx$  : \_\_\_\_\_

(vi)  $\int_0^1 \ln x dx$  : \_\_\_\_\_

(iii)  $\int_1^5 \frac{(u-1)du}{3u^2+u-2}$  : \_\_\_\_\_

(vii)  $\int_{-\infty}^0 \frac{dw}{(w-2)(w-3)}$  : \_\_\_\_\_

(iv)  $\int_0^{\infty} \frac{\sin t}{t} dt$  : \_\_\_\_\_

(viii)  $\int_2^{\pi} \sin \frac{1}{x} dx$  : \_\_\_\_\_

Question # 3: Evaluate the integral:  $\int_{-1}^3 \lfloor x \rfloor e^x dx$ .

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**Question # 4:** Evaluate the integral:  $\int_a^\infty \frac{1}{x} dx$  for  $a > 0$ .

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**Question # 5:** Evaluate the integral:  $\int_a^\infty \frac{1}{x^2} dx$  for  $a > 0$ .

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**Comparison Test:** If  $0 \leq f(x) \leq g(x)$  for  $x \in [a, \infty)$ , then

- $\int_a^\infty f(t)dt$  is convergent if  $\int_a^\infty g(t)dt$  is convergent.
- $\int_a^\infty g(t)dt$  is divergent if  $\int_a^\infty f(t)dt$  is divergent.

The similar result holds for improper integral of 2nd kind.

**Important Integrals:**

- $\int_a^\infty \frac{1}{x^p} dx$  ( $a > 0$ ) converges if  $p > 1$  and diverges if  $p \leq 1$ .
- $\int_0^a \frac{1}{x^p} dx$  ( $a > 0$ ) converges if  $p < 1$  and diverges if  $p \geq 1$ .