National University of Computer & Emerging Sciences, Karachi
Fall-2023 FAST School of Computing
MT-1003
Calculus and Analytical Geometry

- Marks:**100 points**
- Submission date start from **26th October 2023**
- **19th November, 23** will be last day of submission
- In any circumstances no submission will be accepted after **19th November, 23**

Q: 1 Find the area under the graph $f(x) = 4x - x^2$ over the interval $[0, 4]$ using Riemann sum method with x_k^* as the right endpoint of each subinterval.

Q: 2 Evaluate the integral $\int 8x^4 \cos(2x)\, dx$ using tabular integration by parts.

Q: 3 Evaluate the integral $\int_0^1 \frac{x^3}{\sqrt{x^2+1}} dx$

a) Using integration by parts.
b) Using the substitution $u = \sqrt{x^2+1}$

Q: 4 Evaluate the integral if its converges?

a) $\int_{-\infty}^{2} \frac{dx}{x^2+4} dx$
b) $\int_0^1 \frac{1}{2x-1} dx$

Q: 5 Integrate the following functions:

1. $\int_0^3 \frac{x}{\sqrt{3+2x}} dx$
2. $\int \frac{2^y}{2^y+5} dy$
3. $\int \frac{1}{\sqrt{1+x^2}\sinh^{-1} x} dx$
4. $\int \frac{sec^2\theta}{tan^3\theta - tan^2\theta} d\theta$
5. $\int \frac{x^3+8}{(x^2-1)(x-2)} dx$
6. $\int x^5 e^{x^3} dx$
7. $\int \frac{1}{\sqrt{x^2-4x}}$
8. $\int \frac{x}{\sqrt{x^2+4x+5}} dx$
9. $\int \ln(2x+3)\, dx$
10. $\int sin^4 2x\, dx$
11. $\int \frac{\sqrt{1+4x^2}}{x} dx$
12. $\int_0^{ln2} \sqrt{e^x - 1}\, dx$