D1BMC2202   (PAGES 2)   Reg.No.............................

Name: ....

FIRST SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2022

### COMPUTER SCIENCE AND MATHEMATICS (DOUBLE MAIN)

GDMA1B01T: CALCULUS

Time: 2 Hours   **Maximum Marks: 60**

SECTION A: Answer the following questions. Each carries 2 marks.
(Ceiling 20 Marks)

1. Find $\lim_{x \to 1} \sqrt{\frac{2x+14}{x^2+1}}$

2. Find a number δ such that $|f(x) - L| < \epsilon$ whenever $0 < |x - a| < \delta$ for $\lim_{x \to -2}(3x - 2) = -8$; $\varepsilon = 0.05$

3. Suppose that $y = 2x^3 - x + 1$. Find Δx and Δy when x changes from 3 to 3.01

4. Find Δx and Δy when x changes from 2 to 2.02 for $y = \frac{1}{x}$.

5. Find the critical number(s) if any of the function $f(x) = 2x^2 + 4x$.

6. State the Second derivative Test for a function.

7. Find the horizontal and vertical asymptotes if any, of the graph of f.
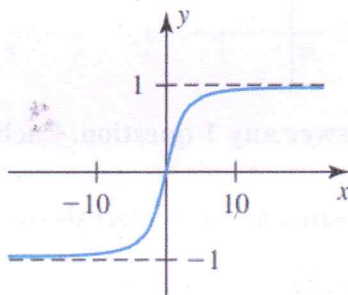
8. Find the indefinite integral, $\int (x^3 - 2x^2 + x + 1)dx$

9. Given that $\int_1^3 f(x)dx = 4$ and $\int_3^6 f(x)dx = 2$. Evaluate the integrals $\int_3^1 2f(x)dx$ and $\int_6^1 f(x)dx$.

10. Evaluate the integral $\int_1^2 (x^2 - 2x^2 + 1)dx$

11. Write the integral that gives the volume of a solid of revolution using the disk method.

12. Write an integral giving the arc length of the graph of the equation $y = 2x^2 + 1$ from $P(-1, 1)$ to $Q(2, 4)$. (Do not evaluate the integral.)

SECTION B: Answer the following questions. Each carries 5 marks
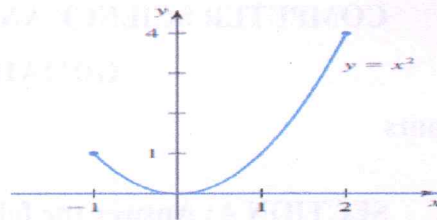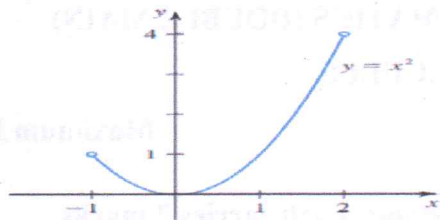### (Ceiling 30 Marks)

13. Find the value of k that will make $f(x)$ continuous where $f(x) = \begin{cases} x + 2 & x \neq -2 \\ kx^2 & x = -2 \end{cases}$

14. Use the definition of the derivative to find the derivative of the function $f(x) = \frac{3}{2x+1}$

15. Find the intervals on which the function $f(x) = x^3 - 6x + 1$ is increasing or decreasing.

(PTO)

16. Find the extreme values of the function and explain with reasons.

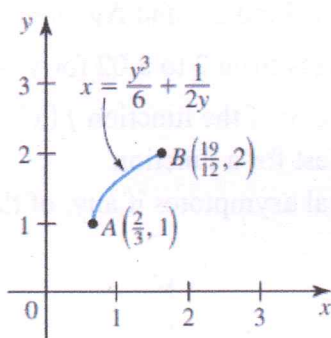   (a) $f(x) = x^2, -1 < x < 2$ (b) $g(x) = x^2, -1 \leq x \leq 2$

17. Find the accumulated amount after 10 years on an investment of $10,000 earning interest at the rate of 12% per year compounded continuously

18. Find the average value of $f(x) = 4 - x^2$ over the interval $[-1,3]$.

19. Find the arc length of the graph from A to B.

$$x = \frac{y^3}{6} + \frac{1}{2y}$$

$B\left(\frac{19}{12}, 2\right)$

$A\left(\frac{2}{3}, 1\right)$

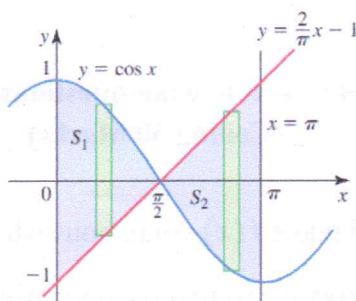**SECTION C: Answer any 1 question. Each carries 10 marks.**

20. The speed of a cyclist is measured at 4-sec intervals over a 32-sec time span and recorded in the following table.

Time(sec.)	0	4	8	12	16	20	24	28	32
Speed(ft/sec)	2	4	6	10	12	14	10	8	6

Find the approximate distance covered by the cyclist from $t = 0$ to $t = 32$ using

    (a) Eight ($n = 8$) rectangles and choosing c_k to be the left endpoint of the kth subinterval.

    (b) Eight ($n = 8$) rectangles and choosing c_k to be the right endpoint of the kth subinterval.

21. Find the area of the region S bounded by the graphs as shown below.

(1 x 10 = 10 Marks)