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D1BMC2302 (S1) **Reg. No.....**

Name: .....

FIRST SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2024

(Improvement/Supplementary)

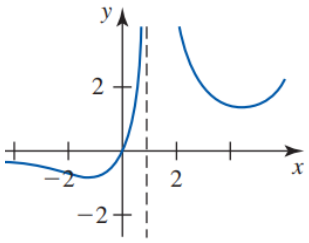
COMPUTER SCIENCE AND MATHEMATICS (DOUBLE MAIN)

GDMA1B01T: CALCULUS

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

SECTION A: Answer the following questions. Each carries *two* marks.
(Ceiling 20 marks)

1. Find the horizontal and vertical asymptotes if any of the graph of f .

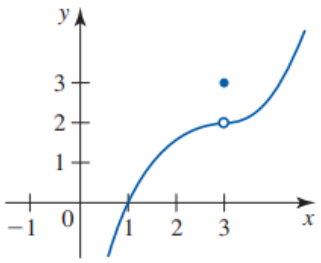


2. Define vertical asymptotes and horizontal asymptotes.
3. Write an integral giving the arc length of the graph of the equation $y = \frac{1}{x^2+1}$ from $P(-1, 1/2)$to $Q(2, 1/5)$. (Do not evaluate the integral)
4. Write the formulas for finding the surface area of a surface of revolution obtained by (a) revolving the graph of a nonnegative smooth function on the interval about the x-axis and (b) revolving the graph of a smooth function on the interval about the y-axis.
5. Write an integral giving the arc length of the graph of the equation $y = x^3 - 1$ over the indicated interval $[0, 1]$. (Do not evaluate the integral.)
6. Find the indefinite integral, $\int (x + 2)dx$.
7. Given that $\int_0^2 f(x)dx = 3$ and $\int_2^5 f(x)dx = -1$, evaluate the integral $\int_0^5 f(x)dx$ and $\int_5^2 f(x)dx$.
8. Evaluate the integral $\int_0^4 2\sqrt{x}dx$.
9. Write the integral that gives the volume of a solid using the method of cross sections.
10. Find $\lim_{x\to 2} f(x)$ if it exists, where f is the piecewise-defined function $f(x) = \begin{cases} 4x + 8 & x \neq 2 \\ 4 & x = 2 \end{cases}$
11. Find a number δ such that $|f(x) - L| < \epsilon$ whenever $0 < |x - a| < \delta$ for $\lim_{x\to 2} 3x = 6;\ \varepsilon = 0.01$
12. Define Inflection points and write down the steps to find inflection points.

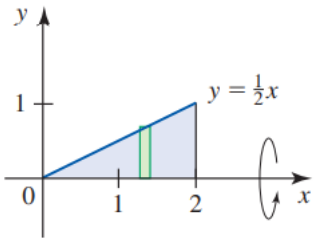
(PTO)

SECTION B: Answer the following questions. Each carries *five* marks.
(Ceiling 30 marks)

13. Using the graph find the following limits.

(a) $\lim_{x\to 3-} f(x)$	
(b) $\lim_{x\to 3+} f(x)$	
(c) $\lim_{x\to 3} f(x)$	

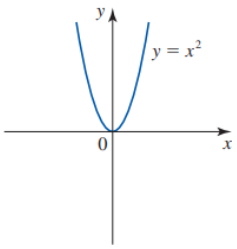
14. Find f by solving the initial value problem $f'(x) = 3x^2 - 6x; f(2) = 4$
15. Find the derivative of the function $F(x) = \int_x^3 \sqrt{1+t^2}dt$ using Fundamental theorem of Calculus.
16. Find the area of the region between the graphs of $y = e^x$ and $y = x$ and the vertical lines $x = 0$ and $x = 3$.
17. Find the relative extrema of $f(x) = x^4 - 4x^3 + 12$
18. Find (a) $\int (x+1)(x^2-2)dx$ (b) $\int \left(\frac{2x^2-1}{x^2}\right) dx$
19. Find the volume of the solid that is obtained by revolving the region about the indicated axis or line.

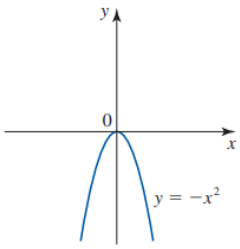


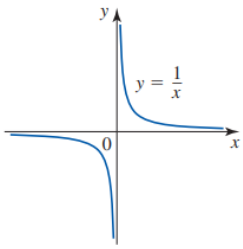
SECTION C: Answer any *one* question. The question carries *ten* marks.

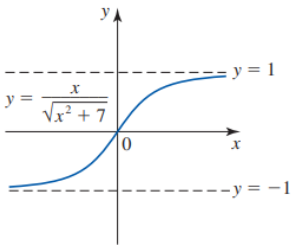
20. Find the slope and an equation of the tangent line to the graph of the equation $y = x^2 + 1$ at the point where $= 2$.
21. Find the extrema of the function if any from the graph and explain with reasons.

$$(a) f(x) = x^2 \quad (b) g(x) = -x^2 \quad (c) h(x) = \frac{1}{x} \quad (d) k(x) = \frac{x}{\sqrt{x^2+7}}$$









(1 x 10 = 10 Marks)