



Time Allowed: 02 Hours 30 Minutes

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Important Instructions / Guidelines:

- Attempt all questions.
- Provide sketching, where necessary.

Question 2

- (a) Solve $(x+3)^2 < 2$ and represent the solution set on real line.
 (b) Determine at which values of x the given function f is continuous? Sketch the graph also.

$$f(x) = \begin{cases} x^2 - 1, & -1 \leq x < 0 \\ 2x, & 0 \leq x < 1 \\ 1, & x = 1 \\ -2x + 4, & 1 \leq x < 2 \\ 0, & 2 \leq x < 3 \end{cases}$$

Question 3

- (a) Find $\frac{dy}{dx}$ for $y = t - \frac{3}{t}$ & $x = t + \frac{3}{t}$
 (b) Find the equations of the tangent and normal lines to the graph of the implicit function determined by the following equation at the point $(1, 1)$.

$$(2x+y)^3 - (3x-y)^3 = y^3$$

Question 4

- (a) Evaluate
 (b) Evaluate

$$\int \frac{5x-3}{x^2-2x-3} dx$$

$$\int_1^e x^2 \ln x dx$$

Question 5

- (a) Determine the following series is convergent or not

$$\sum_{n=1}^{\infty} \frac{n 2^n (n+1)!}{3^n n!}$$

- (b) Find the Taylor series generated by f at $x=-1$, where

$$f(x) = \sqrt{3+x^2}$$

$$x^2 + x - 3x - 3$$