

1) Compute the following integrals:

(a) $\int_1^e \ln x dx$, (b) $\int \frac{x dx}{x^2 + x + 1}$, (c) $\int \frac{x^2 + 1}{x^2 - 1} dx$

2) a) Find the arc length of the curve:

$y = x^4 + (32x^2)^{-1}$ on $[1, 3]$.

b) Find the equation of tangent plane to the surface $x^2 + y^2 + z^2 - 3 = 0$ at $(1, -1, 1)$.

3) a) Let $F(t) = e^t i + (\ln t) j - \frac{3}{t} k$. Find

$\int_1^e F(t) dt$.

b) Calculate $U \cdot (V \times W)$ where $U = i + j - k$, $V = 2i - 3j + 5k$ and $W = 2i + 4j + 8k$.

4) Determine convergence of the following series:

a) $\sum_{k=1}^{\infty} \frac{2^k k!}{k^k}$, (b) $\sum \left(1 + \frac{1}{k}\right)^{-k^2}$

5) a) Determine local extremum values of $f(x, y) = 2x^3 - 6xy + 3y^2$

b) Compute $\int_0^4 \int_{\sqrt{x}}^2 \frac{x}{1+y^5} dy dx$.

Good Luck