

All mobile communication equipments and calculators are not allowed

1) Evaluate the following integrals (3 points)

a) $\int (\ln x)^2 dx$

b) $\int \cos^3 x \sqrt{\csc x} dx$

c) $\int \frac{x^2 + 2x + 3}{x^4 - 1} dx$

d) $\int \frac{1}{1 - \sin x - \cos x} dx$

e) $\int \sqrt{-x^2 + 4x + 5} dx$

2) Determine whether the following integral converges or diverges. If the integral converges, find its value. (3 points)

$$\int_1^{\infty} \frac{1}{x(1 + \ln x)^2} dx$$

3) Let C be the curve whose parametric equations are given as follows:

$$x = \ln(\sec t) \text{ and } y = \tan t - t, \quad 0 \leq t \leq \frac{\pi}{4}$$

a) Find the equation of the tangent line at $t = \frac{\pi}{4}$ on C . (2 points)

b) Find $\frac{d^2 y}{dx^2}$. (2 points)

c) Determine the arc length of C . (3 points)