

Question 1(3+3+3)

a) Find the following limit

$$\lim_{x \rightarrow 1} \left(\frac{1}{x-1} - \frac{1}{\ln x} \right)$$

b) Evaluate the following integral $\int e^x \sin(4x) dx$

c) Evaluate the integral $\int \sec^6 x dx$

Question 2(2+3+3)

a) Find $\int \frac{1}{\sqrt{x^2+6x}} dx$

b) Evaluate $\int \frac{1}{x^3 \sqrt{x^2-1}} dx$

c) Compute the following integral $\int \frac{2x^2-2x+2}{(1-x)(1+x^2)} dx$

Question 3(3+2+3)

a) Find $\int \frac{dx}{5+3\cos x}$

b) Does the integral $\int_0^{\infty} x e^{-2x^2} dx$ converge? If it converges find its value.

c) Sketch the region bounded by the curves: $x = y^2 - 1$, $x = y + 1$, and find its area.