

Question 1. Compute the derivative of the given functions:

(a) $f(x) = \int_4^x (\sin(2t) + e^{t^6} \cos t) dt$

(b) $g(x) = \int_x^{x^3} \frac{e^{\sin \sqrt{u}}}{\sec u + \pi} du$

Question 2. Evaluate the indefinite integrals:

(a) $\int (3x - 5.73)^{13} dx$ (b) $\int x^2 \sin(\pi x) dx$

(c) $\int \frac{a+bx^2}{\sqrt{3ax+bx^3}} dx$ (d) $\int \sin^3 x \cos^2 x dx$

(e) $\int \frac{1}{x^2-1} dx$ (f) $\int \frac{\sqrt{4x^2-1}}{x^4} dx$

Question 3. Evaluate the definite integrals:

(a) $\int_3^9 e^{\sqrt{x}} dx$ (b) $\int_{-\pi}^{\pi} \sin^4 x dx$

(c) $\int_0^1 \frac{d}{dx} e^{\arctan x} dx$ (d) $\int_1^2 \frac{1}{2-3x} dx$

(e) $\int_0^{\pi/2} \frac{\cos x}{1+\sin x} dx$ (f) $\int_{-1}^1 \frac{\sin x}{1+x^2} dx$

Question 4. Evaluate the integral or show that it is divergent:

(a) $\int_1^{\infty} \frac{1}{(2x+1)^3} dx$ (b) $\int_0^{\infty} \frac{\ln x}{x^4} dx$

(c) $\int_0^1 \frac{1}{2-3x} dx$

Question 5. Find the values of p for which the integral converges and evaluate the integral for those values of p .

(a) $\int_e^{\infty} \frac{1}{x(\ln x)^p} dx$ (b) $\int_0^1 \frac{1}{x^p} dx$

Question 6. Find the area of the region bounded by:

(a) $y = 1 + \sqrt{x}$, $y = \frac{3+x}{3}$ (b) $y = e^x$, $y = \sin x$, $x = 0$, $x = \pi/2$

Question 7. Find the length of the curve $y = \frac{x^2}{2} - \frac{\ln x}{4}$, $2 \leq x \leq 4$.