

Question 1: Use the definition of the definite integral in the form

$$\int_a^b f(x) dx = \lim_{n \rightarrow \infty} \sum_{i=1}^n f(x_i) \Delta x$$

to evaluate

$$\int_1^2 (2x^2 + 1) dx$$

Carefully set up the Riemann sum and clearly show the steps of your simplification.

Question 2: A town's population is growing at a rate given by $P'(t) = 1200e^{t/100}$ people per year, where $t = 0$ corresponds to the present. Determine the change in population over the next 100 years.

[5]

Question 3: Evaluate the following definite integrals:

(a) $\int_0^1 (1-x)^{99} dx$

[2]

(b) $\int_1^4 \frac{\sqrt{x} - 3x^2 + 1}{x} dx$

[3]

Question 4: Find the following integrals (Integration by Substitution):

(a) $\int x^2 \sqrt{1+x^3} dx$

[3]

(b) $\int \frac{\cos(\ln(2x))}{x} dx$

[3]

(c) $\int \frac{x}{1+x^4} dx$

[4]

Question 5: Find the following integrals (Integration by Parts):

(a) $\int x^2 e^{2x} dx$

[5]

(b) $\int \arctan(1/x) dx$

[5]

Question 6: Determine $\int \tan^5(x) \sec^4(x) dx$.

[5]

Question 7: Determine $\int \frac{9}{x^2\sqrt{9-x^2}} dx$.

[5]
