

Problem 1: Evaluate the following limits:

$$(a) \lim_{x \rightarrow \infty} \frac{3x^2 + 4x - 3}{2x^2 - x + 7}$$

$$(b) \lim_{x \rightarrow \infty} \frac{1212x^3 + 4x^2 + 5}{x^4 - 12}$$

$$(c) \lim_{x \rightarrow \infty} \frac{x^6 + 4x + 1}{128x^3 + 13x^2 + x + 19}$$

$$(d) \lim_{x \rightarrow \infty} \frac{x + \sin^2 x}{x^3 + 4x + 1}$$

$$(e) \lim_{x \rightarrow \infty} \frac{x^2 + 4x + 9}{2 - e^x}$$

$$(f) \lim_{x \rightarrow \infty} \frac{\ln x}{x + 7}$$

$$(g) \lim_{x \rightarrow \infty} \sqrt[x]{3x}$$

$$(h) \lim_{x \rightarrow \infty} \left(1 + \frac{3}{7x}\right)^{4x/11}$$

$$(i) \lim_{x \rightarrow \infty} x \sin\left(\frac{1}{x}\right)$$

Problem 2: Evaluate the following integrals:

$$(a) \int_1^3 (x^2 + x + 1) dx$$

$$(b) \int_0^{2\pi} \cos x dx$$

$$(c) \int_0^{5\pi/4} \sin x dx$$

$$(d) \int_0^3 e^x dx$$

Problem 3: Evaluate the following integrals:

$$(a) \int \left(3x^2 + 5 - \frac{1}{x^3}\right) dx$$

$$(b) \int \left(\sqrt[3]{x} - \frac{1}{\sqrt[5]{x}}\right) dx$$

$$(c) \int \frac{2}{3x} dx$$

$$(d) \int (\cos x - \sin x) dx$$

$$(e) \int \sec^2 x dx$$

$$(f) \int \cot x \csc x dx$$

$$(g) \int \tan x \sec x dx$$

$$(h) \int \frac{dx}{1 + x^2}$$

$$(i) \int \frac{dx}{\sqrt{1 - x^2}} dx$$

$$(j) \int \sin x \cos x dx$$

Problem 4: Evaluate the following integrals by recognizing them as the area of a certain region:

$$(a) \int_{-2}^6 2 dx$$

$$(b) \int_0^4 3x dx$$

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

$$(d) \int_{-2}^4 (2x + 1) dx$$

$$(e) \int_{-5}^5 \sqrt{25 - x^2} dx$$

$$(f) \int_0^3 \sqrt{9 - x^2} dx$$

Problem 5: Find the average value of the function $f(x) = 3x^2 + 2x + 1$ on $[1, 3]$.

Problem 6: Find the average value of the function $f(x) = \sin x$ on $[0, \pi/2]$.

Problem 7: Find a value c such that $f(c)$ is the average value of $f(x)$ on $[0, 3]$, where $f(x) = x^2 + 1$.

Problem 8: Find a value c such that $f(c)$ is the average value of $f(x)$ on $[0, 1]$, where $f(x) = e^x$.

Problem 9: Determine if the following functions are even, odd, or neither.

$$(a) f(x) = x^4 + 3x^2 + 5$$

$$(d) j(x) = x - \sin x$$

$$(b) g(x) = \tan x$$

$$(e) k(x) = 2 + x \sin^3 x + x^2 \cos x$$

$$(c) h(x) = x^5 - 2x^3 + x - 1$$

$$(f) m(x) = \frac{x - \sin x}{x \cos - x}$$

Problem 10: Evaluate the following integrals:

$$(a) \int_{-10}^{10} (\tan x - x) dx$$

$$(b) \int_{-\pi/7}^{\pi/7} \frac{x^9 - \sin^5 x}{x \cos x + \sqrt[3]{x}} dx$$

$$(c) \int_{-1}^1 x \sqrt{x^2 + \cos^2 x} dx$$