

Problem 1: Use the definition of the derivative to find $f'(x)$ for the function $f(x) = \frac{1}{x}$.

Problem 2: Find the **slope of the tangent** line to the curve $y = \frac{x + \sqrt{x}}{x}$ at $x = 1$.

Problem 3: Find the $\frac{dy}{dx}$ when $y = \sqrt[3]{x}(x^{-1/3} - x^{2/3}) + \pi^3$ at $x = 1$

Problem 4: If the **consumption function** is given by $C = \frac{I^2}{I + 5}$ find the marginal **propensity to save** when $I = 5$

Problem 5: If the demand equation is $p = 125 - 5\sqrt{q^2 + 16}$
(a) Find the rate of change of p with respect to q at $q = 3$.

(b) Find the **percentage rate of change** of p with respect to q at $q = 3$.

(c) Find the marginal revenue function.

Problem 1: Find $\frac{dy}{dx}$ for each of the following:

$$(1) y = \ln \sqrt[3]{\frac{8x^2 + 3}{x^2 + 6x + 1}}$$

$$(2) y = 2^{2x} - \log_3(1+x)$$

$$(3) x^2 y^2 - e^{xy} = -y \text{ at } (0,-1).$$

$$(4) y = (\ln x)^x$$

Problem 2: Find $f^{(50)}(0)$ for the function $f(x) = x^{10} + e^{2x}$