

(5pts) **Problem 1**

Evaluate the following limits

(a) $\lim_{x \rightarrow 0} \frac{e^x - 1}{2x}$

(b) $\lim_{x \rightarrow -\infty} \frac{\sqrt{4x^2 - 7x + 1}}{3x + 2}$

(5pts) **Problem 2**

Find the value (s) of the constant p for which the function f continuous at $x = 0$

$$f(x) = \begin{cases} \frac{\sin 2px}{3x}, & \text{if } x > 0 \\ x^2 + x + 1 & \text{if } x \leq 0 \end{cases}$$

(5pts) **Problem 3**

Find $\frac{dy}{dx}$ for

$$(a) \quad y = \ln \left[\frac{2x + 1}{(x - 6)^5} \right] \qquad (b) \quad x^2 y + y^3 \sec x = 3$$

(5pts) **Problem 4**

A 22-foot ladder is leaning against the wall of a house. The base of the ladder is being pulled away from the wall at a rate of 2 feet per second. How fast is the top of the ladder moving down the wall when the base is 5 feet from the wall?

(5pts) **Problem 5**

Find the absolute extrema of the function $f(x) = 2x - 3x^{\frac{2}{3}}$ on the interval $[-1, 3]$.

(5pts)**Problem 6**

Use definite integrals to evaluate

$$\lim_{n \rightarrow \infty} \sum_{i=1}^n \frac{5}{n} \left(1 + \frac{3i}{n}\right)^3$$

(5pts)**Problem 7**

Find the critical numbers of the function

$$F(x) = \int_1^x (2t^2 + 5t + 3) dt$$

(5pts)**Problem 8**

Find the average value of the function $f(x) = x\sqrt{x^2 + 3}$ on the interval $[1, 6]$.