

Derivatives and Integrals - Worksheet
August 6 - AM

1. Find the average rate of change of $f(x) = x^2 - 3x + 1$ from $x = a$ to $x = a + h$.
2. Find the instantaneous rate of change of $f(x) = x^2 - 3x + 1$ at $x = a$.
3. Evaluate the following limits.

(a) $\lim_{x \rightarrow 0} \frac{\sin(x)}{x}$

(b) $\lim_{x \rightarrow 1} \frac{5x^4 - 4x^2 - 1}{10 - x - 9x^3}$

(c) $\lim_{x \rightarrow \infty} \frac{e^x}{x^2}$

4. Find both partial derivatives of $f(x, y) = \cos(xy)(x^2y - y^3x)$
5. Evaluate the following definite integrals

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

(b) $\int_0^1 \frac{1}{1 + \sqrt{2x}} dx$

6. Evaluate the following indefinite integrals

(a) $\int \frac{1}{1 + e^x} dx$

(b) $\int \sqrt{x}e^{\sqrt{x}} dx$