Course: IN101 Instructor: Qazi Mazhar Ul Haq Due Date: 31-Oct

Calculus Homework Assignment

Problem 1: Domain and Range of Functions Find the domain and range of the following functions, and write your answers in interval notation.

- (a) $f(x) = 2/(3x - 1)$
- (b) $g(x) = \ln(x + 2)$
- (c) $h(x) = \sqrt{(9 - x^2)}$
- (d) $F(t) = 2 + \sin(3t)$

Problem 2: Continuity of Functions Determine whether the following functions are continuous at the specified point. If not, explain why:

- (a) $f(x) = (x^2 - 1)/(x - 1)$, at $x = 1$
- (b) $g(x) = \{ x^2, \text{if } x \leq 0 \; x + 1, \text{if } x > 0 \}$, at $x = 0$

Problem 3: Applications of Limits Calculate the following limits and explain each step:

- (a) $\lim(x \to \infty) (5x^3 - 2x + 1)/(2x^3 + 3)$
- (b) $\lim(x \to 0) (\sqrt{(x+4)} - 2)/x$

Problem 4: Finding Derivatives Find the derivatives of the following functions:

- (a) $f(x) = (3x^2 - 5)/x$
- (b) $g(x) = \ln(x^2 + 1)$
- (c) $h(x) = e^{2x} \sin(x)$

Problem 5: Finding Derivatives and Evaluating Find the derivatives of the following functions and evaluate the derivative at the specified point:

- (a) $f(x) = x^3 - 3x^2 + 2$, find $f'(2)$
- (b) $g(x) = \ln(x^2 + 1)$, find $g'(1)$