

MA161 SEMESTER 1, CALCULUS: PROBLEM SHEET 6

1. Evaluate the following limits

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

(b)  $\lim_{x \rightarrow -1} \frac{x^2 + x - 2}{x - 1}$

(c)  $\lim_{x \rightarrow 1} \frac{x^2 + x - 2}{x - 1}$

(d)  $\lim_{x \rightarrow -3} \frac{x^2 - x - 12}{x + 3}$

(e)  $\lim_{x \rightarrow 5} \frac{x^3 - 3x^2 - 7x - 15}{x - 5}$

2. Let the function  $f$  be defined by

$$f(x) = \begin{cases} 1, & x > 1, \\ x^3, & x \leq 1. \end{cases}$$

Sketch the graph of this function and find the following limits, if they exist.

(a)  $\lim_{x \rightarrow 1^+} f(x)$

(b)  $\lim_{x \rightarrow 1^-} f(x)$

(c)  $\lim_{x \rightarrow 1} f(x)$

3. Evaluate the following limits

(a)  $\lim_{x \rightarrow \infty} 2^x$

(b)  $\lim_{x \rightarrow -\infty} 2^x$

(c)  $\lim_{x \rightarrow \infty} \frac{2x - 9x^3}{2x + 3x^3}$

(d)  $\lim_{x \rightarrow \infty} \frac{x^5 - x^4 + x^3 + x^2}{x^4 + 11}$

(e)  $\lim_{x \rightarrow \infty} \frac{12x - 18x^2 + 6}{8x + x^3 + 16}$