M408C: Problem Set 2

Problem 1

Draw the graph of

$$f(x) = \begin{cases} x^2 & x < 0 \\ x + 3 & x \geq 0, \ x \neq 2 \\ -2 & x = 2 \end{cases}$$

and determine the following limits

$$\lim_{x \to -1} f(x), \quad \lim_{x \to 0^-} f(x), \quad \lim_{x \to 0^+} f(x), \quad \lim_{x \to 2} f(x).$$

Problem 2

Determine the following infinite limits:

$$\lim_{x \to 5^+} \frac{x + 1}{x - 5}, \quad \lim_{x \to 1} \frac{2 - x}{(x - 1)^2}, \quad \lim_{x \to 3^+} \ln(x^2 - 9).$$

Problem 3

Evaluate the following limits if they exist

$$\lim_{x \to 5} \frac{x^2 - 6x + 5}{x - 5}, \quad \lim_{h \to 0} \frac{(2 + h)^3 - 8}{h}, \quad \lim_{h \to 0} \frac{\sqrt{9 + h} - 3}{h}.$$

Problem 4

Determine if the following limits exist, if it does not explain why:

$$\lim_{x \to -6} \frac{2x + 12}{|x + 6|}, \quad \lim_{x \to 0^+} \left(\frac{1}{x} - \frac{1}{|x|} \right).$$

Problem 5

Determine on which intervals the function from the first exercise is continuous.