
Math 1271 – Practice Problems for Midterm Exam I

Lecturer: Walter Littman Jiaping Wang

General remarks: This 50 minute test covers material up to section 2.6. Calculator is **NOT** allowed.

(1) Evaluate

$$\lim_{x \rightarrow 1} \left[\frac{1}{x-1} - \frac{2}{x^2-1} \right]$$

(2) Let

$$f(x) = \begin{cases} (x-1)^3, & \text{if } x < 0; \\ (x+1)^3, & \text{if } x \geq 0. \end{cases}$$

Find the points at which f is discontinuous. At which of these points is f continuous from the right, from the left, or neither.

(3) Find the limit if it exists.

$$\lim_{x \rightarrow \infty} \frac{3x^3 - 2x^2 + 3x}{-x^3 - 2x + 5}$$

(4) Find the limit

$$\lim_{x \rightarrow 2^+} \sqrt{\frac{5x^2}{7+x}}.$$

(5) Find the horizontal and vertical asymptotes of the curve

$$y = \frac{x^2 + 4}{x^2 - 1}.$$

(6) Find the limit

$$\lim_{x \rightarrow \infty} (\sqrt{x^2 - x + 1} - x).$$

(7) Find the limit and determine if the function is continuous at the point being approached.

$$\lim_{x \rightarrow 0} x^2 \sin \left(\frac{x^2 + 1}{x^3 + 3x - 1} \right).$$

(8) Prove, using the ϵ , δ definition of a limit, that

$$\lim_{x \rightarrow 2} (3x - 2) = 4.$$

(9) Prove that the polynomial $P(x) = 3x^3 - x^2 - 2x + 6$ has a root in the interval $-2 \leq x \leq 1$.