

Practice Quiz IC for Math 1501, Calculus I

(I): (25 points) Consider the function

$$\frac{x+2}{x+1}$$

for $x \neq -1$.

- (a) Find all x such that $|f(x) - 2| = 1$.
- (b) Find all x such that $|f(x) - 2| < 1$.
- (c) Find all x such that $|f(x) - 2| < 1/10$.

(II): (30 points) Which of the following limits exist? If they don't exist, explain why not. If they do, compute the value of the limit.

$$\begin{array}{ll} \text{(a)} \quad \lim_{x \rightarrow 0} x^2 \sin(x^2) & \text{(b)} \quad \lim_{x \rightarrow 1} \frac{(x-1)^2}{(x^2-1)^2} \\ \text{(c)} \quad \lim_{x \rightarrow 1} \frac{x^3-1}{x-1} & \text{(d)} \quad \lim_{x \rightarrow 1} \frac{x^3-3}{x-1} \end{array}$$

(III): (20 points) At what points, if any, are the following functions continuous?

(a)

$$f(x) = \begin{cases} x^2, & x \text{ rational} \\ x, & x \text{ irrational} \end{cases}$$

(b)

$$f(x) = \frac{x-2}{|x-2|}$$

(IV): (25 points) For each of the following sequences, determine whether it is bounded or not, and whether it is monotone or not for $n \geq 1$.

$$\begin{array}{lll} \frac{n^2}{n+1} & \text{bounded?} & \text{monotone?} \\ n \sin^2 n & \text{bounded?} & \text{monotone?} \\ \frac{n^2+1}{2^n} & \text{bounded?} & \text{monotone?} \\ \frac{\sqrt{n+1}}{\sqrt{n}} & \text{bounded?} & \text{monotone?} \end{array}$$