

Read each question carefully. You must show ALL WORK in order to earn full credit. Circle your final answer. Each question is worth 10 points.

1. Find the limit , then use the $\varepsilon - \delta$ definition to prove that the limit is L .

$$\lim_{x \rightarrow 8} (3x - 20)$$

2. Find the limit (if it exists).

$$\lim_{x \rightarrow -3} \frac{x^2 + 7x + 12}{x^2 - 9}$$

3. Find the limit (if it exists).

$$\lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}, \text{ where } f(x) = 5x^2 + 3$$

4. Find the limit (if it exists).

$$\lim_{x \rightarrow 0} \frac{5 \sin 2x}{3x}$$

5. Find the limit (if it exists).

$$\lim_{x \rightarrow -5} f(x), \quad f(x) = \begin{cases} -x^2 + 8, & x \leq -5 \\ 2x + 3, & x > -5 \end{cases}$$

6. Find the limit (if it exists). Show SOME sort of work, whether it's a graph or definition of absolute value of $x-6$ -- show me how you arrived at your answer.

$$\lim_{x \rightarrow 6^-} \frac{|x - 6|}{x - 6}$$

7. Use the Squeeze Theorem to find $\lim_{x \rightarrow 0} f(x)$. You must show use of the squeeze theorem.

$$f(x) = 5x^2 \sin \frac{1}{x}$$

8. Determine if the Intermediate Value Theorem guarantees a c in the interval $[-2, 3]$ such that $f(c) = -4$, and if so, find all such values of c .

$$f(x) = x^2 - 7x + 2$$

9. Discuss the continuity of the function (identify all discontinuities, if any, as removable or non-removable).

$$f(x) = \frac{x^2 - 7x + 10}{x^2 - 3x + 2}$$

10. Find the limit (if it exists).

$$\lim_{x \rightarrow -2^+} \frac{\sqrt{x + 11} - 3}{x^2 + 5x + 6}$$

Bonus: Find the limit (if it exists). Hint: $\cos(a + b) = \cos a \cos b - \sin a \sin b$

$$\lim_{h \rightarrow 0} \frac{f(x + h) - f(x)}{h}, \text{ where } f(x) = \cos x$$