

Problem 1: (10 points) If it exists, find the limit. Use the symbols ∞ or $-\infty$ as appropriate.

a) $\lim_{x \rightarrow 1^-} (x^2 - 2x + 3)$

b) $\lim_{x \rightarrow 1} \frac{x^2}{|x|}$

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

d) $\lim_{x \rightarrow 1} \frac{1}{x^2 - 1}$

e) $\lim_{x \rightarrow \infty} \frac{x + x\sqrt{x}}{x^2 + 2x - 1}$

Problem 2: (4 points)

a) Find all values of x at which $f(x) = 2 - \frac{x}{x^2 - 3x}$ are discontinuous.

b) Find all values of C which will make the following function continuous.

$$f(x) = \begin{cases} 2C - x & \text{if } x \leq 1, \\ x^2 - 5C & \text{if } x > 1. \end{cases}$$

Problem 3: (6 points)

a) Use the definition of the derivative to find $f'(2)$ where $f(x) = 2 - 3x$.

b) Find the slope of the line tangent to the graph of $f(x) = x^3\sqrt{x} + \pi^5$ at $x = 1$. (Do not use the definition of the derivative.)

Problem 1: (10 points) If it exists, find the limit. Use the symbols ∞ or $-\infty$ as appropriate.

a) $\lim_{x \rightarrow 1^+} (x^2 - 3x + 4)$

b) $\lim_{x \rightarrow 1} \frac{|x|}{x^2}$

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

d) $\lim_{x \rightarrow 2} \frac{1}{x^2 - 4}$

e) $\lim_{x \rightarrow \infty} \frac{x^2 + 2x - 1}{2x^2 + x\sqrt{x}}$

Problem 2: (4 points)

a) Find all values of x at which $f(x) = 1 + \frac{x}{x^2 - 2x}$ are discontinuous.

b) Find all values of C which will make the following function continuous.

$$f(x) = \begin{cases} 3C - x & \text{if } x \leq 2, \\ x^2 - 2C & \text{if } x > 2. \end{cases}$$

Problem 3: (6 points)

a) Use the definition of the derivative to find $f'(2)$ where $f(x) = 3 - 2x$.

b) Find the slope of the line tangent to the graph of $f(x) = x^2\sqrt{x} + e^5$ at $x = 4$. (Do not use the definition of the derivative)