

Problem 1: If it exists, find the limit. If it does not exist, show why. Use the symbols ∞ or $-\infty$ as appropriate.

(a) $\lim_{x \rightarrow 2} \frac{x^2 - 2x}{x^2 + x - 6}$

(b) $\lim_{x \rightarrow 1} \frac{|1 - x|}{1 - x}$

(c) $\lim_{x \rightarrow -\infty} \frac{1 - 2x^2 - 2x}{3x^2 + x - 10}$

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

Problem 2:

(1) Use the definition of the derivative to find $f'(3)$ where $f(x) = \sqrt{x+1}$.

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

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

(3) Find the slope of the line tangent to the graph of $f(x) = \frac{1-2x^2}{\sqrt{x}} + 3\pi^2$ at $x = 4$. (**Do not use the limit**)

(4) Estimate the cost of producing unit number 10 if the cost function is $C(x) = 2x^2 - 15x + 3$

Problem 1: If it exists, find the limit. If it does not exist, show why. Use the symbols ∞ or $-\infty$ as appropriate.

(a) $\lim_{x \rightarrow -2} \frac{x^2 + 2x}{x^2 - x - 6}$

(b) $\lim_{x \rightarrow -1^+} \frac{1}{1+x}$

(c) $\lim_{x \rightarrow \infty} \frac{10 - 2x^2 - 21x}{3x^2 + 3x - 10}$

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

Problem 2:

(1) Use the definition of the derivative to find $f'(5)$ where $f(x) = \sqrt{x-1}$.

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

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

(3) Find the slope of the line tangent to the graph of $f(x) = \frac{x - 2\sqrt{x}}{\sqrt{x}} + 2\pi^5$ at $x = 4$. (**Do not use the limit**)

(4) Estimate the profit from selling unit number 10 if the profit function is $P(x) = 2x^2 - 15x + 3$