

**SHOW ALL YOUR WORK. NO CREDITS FOR WNSWERS NOT SUPPORTED BY WORK.**

**Problem 1:** Consider The function  $f(x) = \frac{x-1}{x^2+x-2}$ .

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

(a)  $\lim_{x \rightarrow 1} f(x)$

(b)  $\lim_{x \rightarrow -2} f(x)$

(c)  $\lim_{x \rightarrow \infty} f(x)$

(2) Find all points of discontinuity of  $f(x)$  and state the type of each one.

**Problem 2:**

(1) Use the definition of the derivative to find  $f'(0)$  where  $f(x) = \sqrt{1-x}$ .

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

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

(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)**

**SHOW ALL YOUR WORK. NO CREDITS FOR WNSWERS NOT SUPPORTED BY WORK.**

**Problem 1:** Consider The function  $f(x) = \frac{x^2 + 2x}{x^2 - x - 6}$ .

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

(d)  $\lim_{x \rightarrow 0} f(x)$

(e)  $\lim_{x \rightarrow -2} f(x)$

(f)  $\lim_{x \rightarrow \infty} f(x)$

(2) Find all points of discontinuity of  $f(x)$  and state the type of each one.

**Problem 2:**

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

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

$$f(x) = \begin{cases} 2x - C + 1 & \text{if } x \leq 2, \\ x^2 + 3C & \text{if } x > 2. \end{cases}$$

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

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**Problem 1:** Consider The function  $f(x) = \frac{2x - x^2}{x^2 + x - 6}$ .

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

(g)  $\lim_{x \rightarrow 0} f(x)$

(h)  $\lim_{x \rightarrow 2} f(x)$

(i)  $\lim_{x \rightarrow \infty} f(x)$

(2) Find all points of discontinuity of  $f(x)$  and state the type of each one.

**Problem 2:**

(1) Use the definition of the derivative to find  $f'(3)$  where  $f(x) = 1 - x^2$ .

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

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

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