

Q1. Given $f(x) = \begin{cases} 3 - 4x & \text{for } x < 1, \\ x + 2a & \text{for } x \geq 1. \end{cases}$ Find a so that $\lim_{x \rightarrow 1} f(x)$ exists.

Q2. Find the limit $\lim_{x \rightarrow 1} \frac{x-1}{\sqrt{1+3x^2}-2}$

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Q3. Find any relative extrema of $f(x) = e^x(3 - 2x)$. State where the function is increasing or decreasing.

Q4. Let f be a function given by $f(x) = \begin{cases} x^2 + 2x & \text{for } x > 1, \\ mx - b & \text{for } x \leq 1. \end{cases}$

Determine the values of m and b that make $f(x)$ differentiable at $x = 1$?

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