Name: _Richard_

Directions: Closed book, closed notes, no calculators.

By submitting this quiz you affirm that you agree with this statement: *On my honor, I have neither given nor received unauthorized aid on this assignment, and I pledge that I am in compliance with the VCU Honor System.*

1. (20 points) Use the limit definition $f'(x) = \lim\limits_{w \to x} \dfrac{f(w) - f(x)}{w - x}$ to find the derivative of $f(x) = \dfrac{1}{3x - 1}$.

Please present your work in a linear, organized fashion. Show all steps.

$$f'(x) = \lim_{w \to x} \frac{f(w) - f(x)}{w - x} = \lim_{w \to x} \frac{\frac{1}{3w-1} - \frac{1}{3x-1}}{w - x}$$

$$= \lim_{w \to x} \frac{\frac{1}{3w-1} - \frac{1}{3x-1}}{w - x} \cdot \frac{(3w-1)(3x-1)}{(3w-1)(3x-1)}$$

$$= \lim_{w \to x} \frac{(3x-1) - (3w-1)}{(w-x)(3w-1)(3x-1)}$$

$$= \lim_{w \to x} \frac{3x - 3w}{(w-x)(3w-1)(3x-1)}$$

$$= \lim_{w \to x} \frac{-3(w-x)}{(w-x)(3w-1)(3x-1)}$$

$$= \lim_{w \to x} \frac{-3}{(3w-1)(3x-1)} = \frac{-3}{(3x-1)(3x-1)} = \frac{-3}{(3x-1)^2}$$

$\underline{Answer:}$ $\boxed{f'(x) = \dfrac{-3}{(3x-1)^2}}$