

Math 31 - Quiz 1.1 - PRSD VC

20 February 2019

Name __ KEY __

From basic principles, directly from **the definition of a derivative**, that is, using either

$$\frac{d}{dx}f(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h} \quad \text{or} \quad \frac{d}{dx}f(x) = \lim_{a \rightarrow x} \frac{f(x) - f(a)}{x - a},$$

determine the derivative of $f(x) = \frac{2}{3x-5}$

Solution:

$$\begin{aligned} f'(x) &= \lim_{h \rightarrow 0} \frac{\frac{2}{3(x+h)-5} - \frac{2}{3x-5}}{h} \\ &= \lim_{h \rightarrow 0} \frac{2(3x-5) - 2(3x+3h-5)}{h(3x+3h-5)(3x-5)} \\ &= \lim_{h \rightarrow 0} \frac{6x-10-6x-6h+10}{h(3x+3h-5)(3x-5)} \\ &= \lim_{h \rightarrow 0} \frac{-6h}{h(3x+3h-5)(3x-5)} \\ &= \lim_{h \rightarrow 0} \frac{-6}{(3x+3h-5)(3x-5)} \\ &= \frac{-6}{(3x-5)(3x-5)} \\ &= \frac{-6}{(3x-5)^2} \end{aligned}$$