

Quiz 5Name: ME

Write legible.

1. (2 points) Suppose f is a differentiable function at a . Give an equation for the line tangent to the graph of f at $(a, f(a))$.

An equation for the line tangent to the graph of f at $(a, f(a))$ is: $y - f(a) = f'(a)(x - a)$.

2. (6 points) Suppose $y = f(x)$ is a differentiable function.

- (a) Define the average rate of change of y with respect to x over the interval $[x_1, x_2]$.

The average rate of change of y with respect to x over $[x_1, x_2]$ is $\frac{\Delta y}{\Delta x} = \frac{f(x_2) - f(x_1)}{x_2 - x_1}$.

- (b) Define the instantaneous rate of change of y with respect to x at $x = x_1$.

The instantaneous rate of change of y wrt x at $x = x_1$ is $\frac{dy}{dx} \Big|_{x=x_1} = \lim_{\substack{\Delta x \rightarrow 0 \\ x_1 \text{ fix}}} \frac{\Delta y}{\Delta x} = \lim_{x_2 \rightarrow x_1} \frac{f(x_2) - f(x_1)}{x_2 - x_1}$.

- (c) Define the derivative of f at x_1 .

The derivative of f at x_1 is:

$$f'(x_1) = \lim_{x_2 \rightarrow x_1} \frac{f(x_2) - f(x_1)}{x_2 - x_1} = \frac{dy}{dx} \Big|_{x=x_1}$$

3. (2 points) Find the derivatives of the following functions.

(a) $h(t) = \frac{\sin(t)}{2} + \frac{5}{t}$.

$$\Rightarrow h'(t) = \frac{1}{2} \cos(t) - 5t^{-2}$$

(b) $g(x) = x^{5/3} - x^{-5/3}$.

$$\Rightarrow g'(x) = \frac{5}{3} x^{2/3} + \frac{5}{3} x^{-8/3}$$