

# MAP-4384 Quiz 1

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## 1 Approximation Of The Derivative

The derivative of a continuous function  $f$  is defined by the following equation.

$$f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h} \quad (1)$$

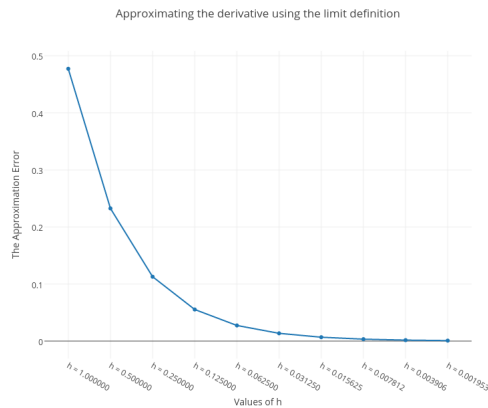
So, if we would like to approximate the derivative of a continuous function  $f$  at a point  $x$ , then we may use the formula

$$f'(x) \approx f_a(x) = \frac{f(x+h) - f(x)}{h} \quad (2)$$

For some  $h$ . As  $h \rightarrow 0$ ,  $f'_a(x) \rightarrow f'(x)$ . We can determine the error of our approximation,  $\epsilon$  with the formula

$$\epsilon = |f'(x) - f_a(x)| \quad (3)$$

Below is a graph of the error,  $\epsilon$  of the aprixmate derivative of  $\sin(\pi/3)$ .



As we can see, as  $h \rightarrow 0$ ,  $\epsilon \rightarrow 0$ .