- **Definition (derivative)**

$$f'(c) = \lim_{x \to c} \frac{f(x) - f(c)}{x - c}$$

If $f'(c)$ exists then f is said to be differentiable at c

- **Alternative definition**

$$f'(c) = \lim_{h \to 0} \frac{f(c + h) - f(c)}{h}$$

- **Theorem**
  If f is differentiable at c, then f must be continuous at c
- But the converse is not true! For example, $f(x) = |x|$

A pseudocode to compute $f'(x)$ at the point $x = 0.5$ with $f(x) = \sin(x)$.

program First
integer parameter $n \leftarrow 10$
integer i
real $error, h, x, y$
$x \leftarrow 0.5$
$h \leftarrow 1$
for $i = 1$ **to** n **do**
    $h \leftarrow 0.25h$
    $y \leftarrow [\sin(x + h) - \sin(x)]/h$
    $error \leftarrow |\cos(x) - y|$
    output $i, h, y, error$
end for
end program First