Concepto derivada

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

$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h} = \lim_{x \to a} \frac{f(x) - f(a)}{x - a} = \lim_{\Delta x \to 0} \frac{\Delta y}{\Delta x}$$

Tabla de derivación

$y = k \quad \forall k \in R \quad y' = 0$

$y = u \quad u = x \quad y' = 1$

$y = u \quad u = u(x) \quad y' = u'$

$y = k \cdot u \quad y' = k \cdot u'$

$y = u + v - w \quad y' = u' + v' - w'$

$y = u \cdot v \quad y' = u' \cdot v + u \cdot v'$

$y = \frac{u}{v} \quad y' = \frac{u' \cdot v - u \cdot v'}{v^2}$

$y = u^n \quad y' = n \cdot u^{n-1} \cdot u'$

$y = \sqrt[n]{u} \quad y' = \frac{u'}{n \cdot \sqrt[n]{u^{n-1}}}$

$y = \log_a u \quad y' = \frac{u'}{u} \log_a e$

$y = L(u) \quad y' = \frac{u'}{u}$

$y = a^u \quad y' = u' \cdot a^n \cdot L(a)$

$y = e^u \quad y' = u' \cdot e^u$

$y = u^v \quad y' = v' \cdot u^v \cdot L(u) + v \cdot u^{v-1} \cdot u'$

$y = \operatorname{sen} u \quad y' = u' \cdot \cos u$

$y = \cos u \quad y' = -u' \cdot \operatorname{sen} u$

$y = \operatorname{tg} u \quad y' = \frac{u'}{\cos^2 u} = u'(1 + \operatorname{tg}^2 u) = u' \cdot \sec^2 u$

$y = \cot u \quad y' = \frac{-u'}{\operatorname{sen}^2 u} = -u'(1 + \cot^2 u) = -u' \cdot c\sec^2 u$

$y = \operatorname{arcsen} u \quad y' = \frac{u'}{\sqrt{1 - u^2}}$

$y = \arccos u \quad y' = \frac{-u'}{\sqrt{1 - u^2}}$

$y = \operatorname{arctg} u \quad y' = \frac{u'}{1 + u^2}$

Aplicaciones de la derivada

$f'(a) \geq 0$ — *f(x) creciente en x = a*

$f'(a) > 0$ — *f(x) extrictamente creciente en x = a*

$f'(a) \leq 0$ — *f(x) decreciente en x = a*

$f'(a) < 0$ — *f(x) extrictamente decreciente en x = a*

$$f'(a) = 0 \begin{cases} f''(a) > 0 & \text{Minimo relativo en } x = a \text{ (convexa)} \\ f''(a) < 0 & \text{Maximo relativo en } x = a \text{ (concava)} \end{cases}$$

$$f''(a) = 0 \rightarrow f'''(a) \neq 0 \rightarrow \text{Punto de inflexion en } x = a$$