Derivatives

Defining $u(t)$ and $v(t)$ as functions of t the following rules apply:

- $\frac{\partial}{\partial t}(constant) = 0$
- $\frac{\partial}{\partial t}(at + b) = a$
- $\frac{\partial}{\partial t}(u + v) = \frac{\partial}{\partial t}u + \frac{\partial}{\partial t}v$
- $\frac{\partial}{\partial t}(u.v) = \frac{\partial}{\partial t}(u).v + u.\frac{\partial}{\partial t}v$
- $\frac{\partial}{\partial t}(au) = a\frac{\partial}{\partial t}u$
- $\frac{\partial}{\partial t}(u^n) = n.u^{n-1}.\frac{\partial}{\partial t}u$
- $\frac{\partial}{\partial t}\left(\frac{u}{v}\right) = \frac{\frac{\partial}{\partial t}(u).v - u.\frac{\partial}{\partial t}v}{v^2}$
- $\frac{\partial}{\partial t}\left(\sqrt[n]{u}\right) = \frac{\frac{\partial}{\partial t}u}{n.\sqrt[n]{u^{n-1}}}$
- $\frac{\partial}{\partial t}(u \circ v) = \frac{\partial}{\partial t}[u(v)].\frac{\partial}{\partial t}v$

Exponential

- $\frac{\partial}{\partial t}a^u = \frac{\partial}{\partial t}(u).a^u.\ln(a)$
- $\frac{\partial}{\partial t}e^u = \frac{\partial}{\partial t}(u).e^u$
- $\frac{\partial}{\partial t}(u^v) = v.u^{v-1}.\frac{\partial}{\partial t}u$

Logarithmic

- $\frac{\partial}{\partial t}\ln(u) = \frac{\frac{\partial}{\partial t}u}{u}$
- $\frac{\partial}{\partial t}\log_a(u) = \frac{\frac{\partial}{\partial t}u}{u.\ln(a)}$

Trigonometric

- $\frac{\partial}{\partial t}sin(u) = \frac{\partial}{\partial t}(u).cos(u)$
- $\frac{\partial}{\partial t}cos(u) = -\frac{\partial}{\partial t}(u).sin(u)$
- $\frac{\partial}{\partial t}tan(u) = \frac{\frac{\partial}{\partial t}u}{\cos(u)^2} = \frac{\partial}{\partial t}(\mathrm{u}).\sec(u)^2$
- $\frac{\partial}{\partial t}cot(u) = -\frac{\frac{\partial}{\partial t}u}{\sin(u)^2} = -\frac{\partial}{\partial t}(u).\csc(u)^2$
- $\frac{\partial}{\partial t}\sec(u) = \frac{\partial}{\partial t}(u).\sec(u).tan(u)$
- $\frac{\partial}{\partial t}csc(u) = -\frac{\partial}{\partial t}(u).csc(u).cot(u)$

Inverse Trigonometric

- $\frac{\partial}{\partial t}sin(u)^{-1} = \frac{\frac{\partial}{\partial t}u}{\sqrt{1-u^2}}$
- $\frac{\partial}{\partial t}\cos(u)^{-1} = -\frac{\frac{\partial}{\partial t}u}{\sqrt{1-u^2}}$
- $\frac{\partial}{\partial t}\tan(u)^{-1} = \frac{\frac{\partial}{\partial t}u}{1+u^2}$
- $\frac{\partial}{\partial t}\cot(u)^{-1} = -\frac{\frac{\partial}{\partial t}u}{1+u^2}$
- $\frac{\partial}{\partial t}\sec(t)^{-1} = \frac{\frac{\partial}{\partial t}u}{u.\sqrt{u^2-1}}$
- $\frac{\partial}{\partial t}\csc(t)^{-1} = -\frac{\frac{\partial}{\partial t}u}{u.\sqrt{u^2-1}}$