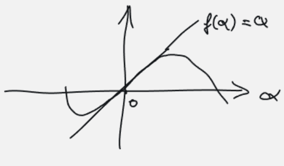
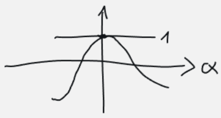
Mathematik

- $\alpha \approx 0$: $\sin\alpha = \alpha$ α in Bogenmaß ($0-360°$ → $0-2\pi$)

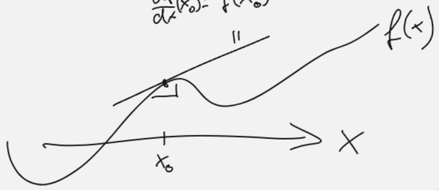
  $\cos\alpha = 1$

  $\tan\alpha = \frac{\sin\alpha}{\cos\alpha} = \frac{\alpha}{1} = \alpha$





- $\frac{df}{dx}(x_0) = f'(x_0)$



f, g Funk. $\lambda \in \mathbb{R}$ Regeln

$(f+g)' = f'(x) + g'(x)$

$(\lambda f(x))' = \lambda f'(x)$

$(f \cdot g)' = f' \cdot g + f \cdot g'$

$(f(g(x)))' = f'(g(x)) \cdot g'(x)$

$(x^n)' = n(x^{n-1})$

$(e^x)' = e^x$

$(\sin x)' = \cos x$

$(\cos x)' = -\sin x$

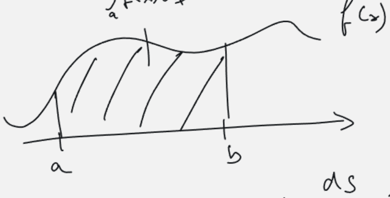
$(a)' = 0$

$$\boxed{P_n(x) = a_0 + a_1 x + a_2 x^2 + \dots + a_n x^n}$$

$$P_n'(x) = (a_0)' + (a_1 x)' + \dots + (a_n x^n)'$$
$$= 0 + a_1 (x)' + (x^2)' + a_n (x^n)'$$
$$= 0 + a_1 1 \cdot 1 + a_2 2 \cdot x + \dots a_i \cdot i \cdot x^{i-1} + \dots + a_n n x^{n-1}$$

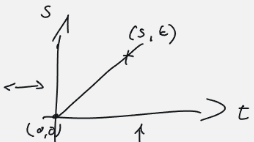
Taylor-Reihe
(3blue 1brown)

- $\int_a^b f(x)\,dx$

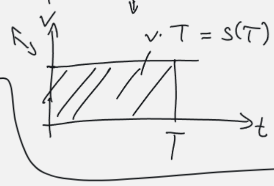


$$\boxed{\int_a^b f'(x)\,dx = f(b) - f(a)}$$

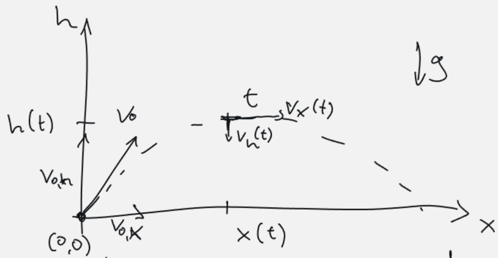
$\hookrightarrow$ $v = \frac{ds}{dt} \mathrel{\hat{=}} \frac{s}{t}$



$s = \int v\,dt \mathrel{\hat{=}} v \cdot t$



$\downarrow g$



$\frac{dv_h}{dt}(t) = a_h(t) = -g$

$\hookrightarrow v_h(t) = \int -g\,dt = -g \cdot t + c$

$-g \cdot 0 + c = v_h(0) = v_{0,h}$

$\hookrightarrow v_h(t) = -g \cdot t + v_{0,h}$

$\frac{dv_x}{dt} = a_x(t) = 0$

$v_x(t) = \int 0\,dt = d$

$v_x(0) = v_{0,x} = d$

$\hookrightarrow v_x(t) = v_{0,x}$

$\int x^n\,dx = \frac{x^{n+1}}{n+1}$

$\int x^2\,dx = \frac{x^3}{3}$

$$h(t) = \int v_h(t)\,dt = \int -g \cdot t + v_{0,h}\,dt$$
$$= \int -g \cdot t\,dt + \int v_{0,h}\,dt$$
$$= -g \int t\,dt + \int v_{0,h}\,dt$$
$$= -g\left(\frac{t^2}{2} + c_1\right) + v_{0,h} t + c_2$$
$$= -g\frac{t^2}{2} + v_{0,h} t + \underbrace{(c_2 - g c_1)}_{c_3}$$

$0 = h(0) = 0 + 0 + c_3$

$\hookrightarrow c_3 = 0$

$h(t) = -g\frac{t^2}{2} + v_{0,h} t$

$x(t) = v_{0,x} t$

$\Rightarrow t = \frac{x}{v_{0,x}}$

$$h(x) = -g\frac{x^2}{2 v_{0,x}^2} + \frac{v_{0,h}}{v_{0,x}} x$$