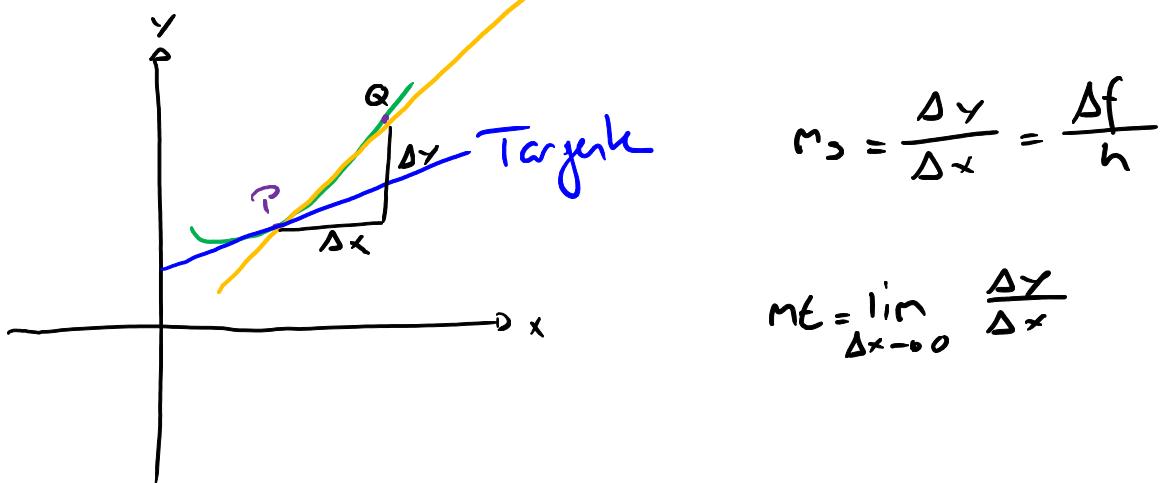


Kapitel 3.1



$$m_s = \frac{\Delta y}{\Delta x} = \frac{\Delta f}{h}$$

$$m_t = \lim_{\Delta x \rightarrow 0} \frac{\Delta y}{\Delta x}$$

Bsp. 3.1:

$$y = \frac{1}{x}$$

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

$$= \lim_{h \rightarrow 0} \frac{\frac{x - (x+h)}{(x+h)x}}{h} = \lim_{h \rightarrow 0} \frac{\frac{-h}{x^2 + hx}}{h}$$

$$= \lim_{h \rightarrow 0} \frac{-1}{x^2 + hx} = \lim_{h \rightarrow 0} \frac{-1}{x^2 + h x} = -\frac{1}{x^2}$$

lostet gegen 0

ASleitw

$$y = \frac{1}{x} \quad y' = \frac{1}{x^2}$$

Steigung bei $x=1$

$$y'(1) = -\frac{1}{1} = -1$$

Targete bei $x=1$

$$y_T = -x + b$$

$$1 = -1 + b \Rightarrow b = 2$$

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

$$f(x) = x^2$$

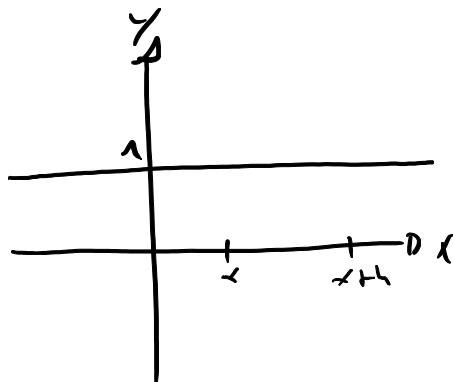
$$\begin{aligned} f'(x) &= \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h} = \lim_{h \rightarrow 0} \frac{(x+h)^2 - x^2}{h} \\ &= \lim_{h \rightarrow 0} \cancel{\frac{x^2 + 2hx + h^2 - x^2}{h}} = \lim_{h \rightarrow 0} (2x + h) = 2x \end{aligned}$$

Kapitel 3.3

$$y = x^0 = 1$$

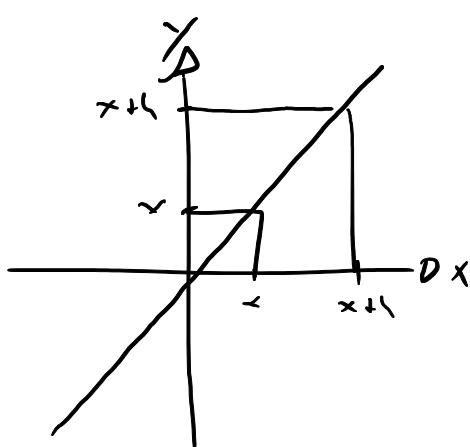
$$y' = 0$$

$$f(x+h) - f(x) = 0$$



$$y = x^1 = x$$

$$\frac{f(x+h) - f(x)}{h} = \frac{x+h - x}{h} = \frac{h}{h} = 1$$



$$f(x) = x^2$$

f

$$x^0$$

$$x^1$$

$$x^2$$

↓

$$x^n$$

$$f'(x) = 2x$$

f'

$$0 \\ 1 \cdot x^0 = 1$$

$$2 \cdot x^1 =$$

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

Exponent von x wird um 1 Fakten

Bsp.: Potenzregel

$$f(x) = x^{\frac{2}{3}}$$

$$f'(x) = \frac{2}{3} \cdot x^{-\frac{1}{3}}$$

$$f(x) = x^{-\frac{1}{2}}$$

$$f'(x) = -\frac{1}{2} \cdot x^{-\frac{3}{2}}$$

$$f(x) = \frac{1}{x^4} = x^{-4}$$

$$f'(x) = -4 \cdot x^{-5} = -\frac{4}{x^5}$$

$$f(x) = x^{-\frac{4}{3}}$$

$$f'(x) = -\frac{4}{3} \cdot x^{-\frac{7}{3}}$$

Faktorregel

$$f(x) = 7 \cdot x^4$$

$$f'(x) = 7 \cdot 4x^3 = 28x^3$$

Sommerregel

$$f(x) = 7x^4 - 2x^3$$

$$f'(x) = 28x^3 - 6x^2$$

Produktregel

$$f(x) = \underbrace{(3x+1)}_u \underbrace{(x-4)}_v$$

$$[uv]' = u'v + uv'$$

$$u = 3x+1 \quad u' = 3$$

$$v = x-2 \quad v' = 1$$

$$\begin{aligned} f'(x) &= 3(x-2) + (3x+1)1 \\ &= 3x-6 + 3x+1 = 6x-5 \end{aligned}$$

Quotientenregel

$$f(x) = \frac{3x+1}{x-2} \quad \begin{matrix} \text{vertikale Asymptote } x=2 \\ \text{horizontale Asymptote } y=3 \end{matrix}$$

$$\left[\frac{u}{v}\right]' = \frac{u'v - uv'}{v^2}$$

$$f'(x) = \frac{3(x-2) - (3x+1)1}{(x-2)^2} = \frac{3x-6-3x-1}{(x-2)^2} = \frac{-7}{(x-2)^2}$$

3.4 wird nicht beschriftet



Kapitel 3.5

$$y = \sin x \quad y' = ?$$

$$\lim_{h \rightarrow 0} \frac{\sin(x+h) - \sin x}{h}$$



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

$$\begin{array}{l} y = \sin x \\ ' \downarrow \\ y = \cos x \\ ' \downarrow \\ y = -\sin x \\ ' \downarrow \\ y = -\cos x \\ ' \end{array}$$