a) Initial loan: S

1 month: $\underbrace{S\cdot 1.003 - 1000}_{*}$

2 months: $* \cdot 1.003 - 1000 = S\cdot(1.003)^2 - (1000 + 1.003\cdot 1000)$

3 $\qquad S\cdot(1.003)^3 - \underbrace{(1000 + 1.003\cdot 1000 + 1.003^2\cdot 1000)}_{k=3}$

paid to bank

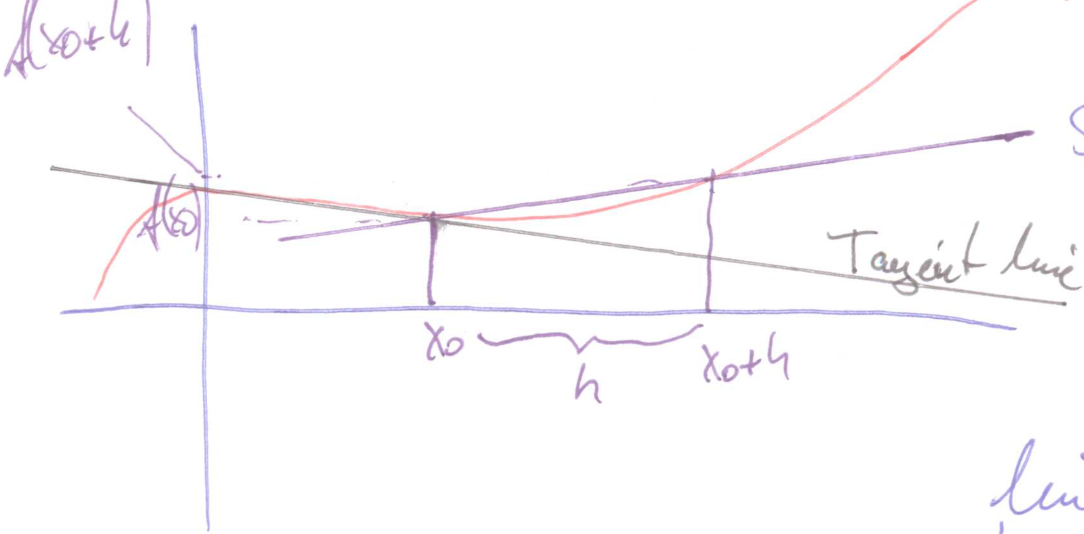
⋮

k $\qquad$ Formula $L(k) = \ldots$

b) Set $L(360) = 0$, solve for S

c) New formula (for 1100). Find k s.t. $L_{new}(k) \leq 0$

same S as in b)



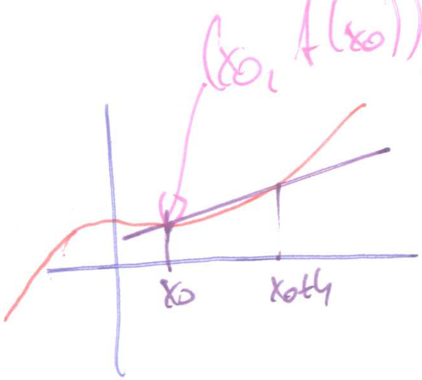
Difference Quotient

$$\text{Slope: } \frac{\Delta y}{\Delta x} = \boxed{\frac{f(x_0+h) - f(x_0)}{\cancel{x_0} + h - \cancel{x_0}}}$$

Now consider limit as $h \to 0$

$$\lim_{h\to 0} \frac{f(x_0+h) - f(x_0)}{h}$$

Def: If the limit $L = \lim_{h \to 0} \frac{f(x_0+h) - f(x_0)}{h}$ exists then:



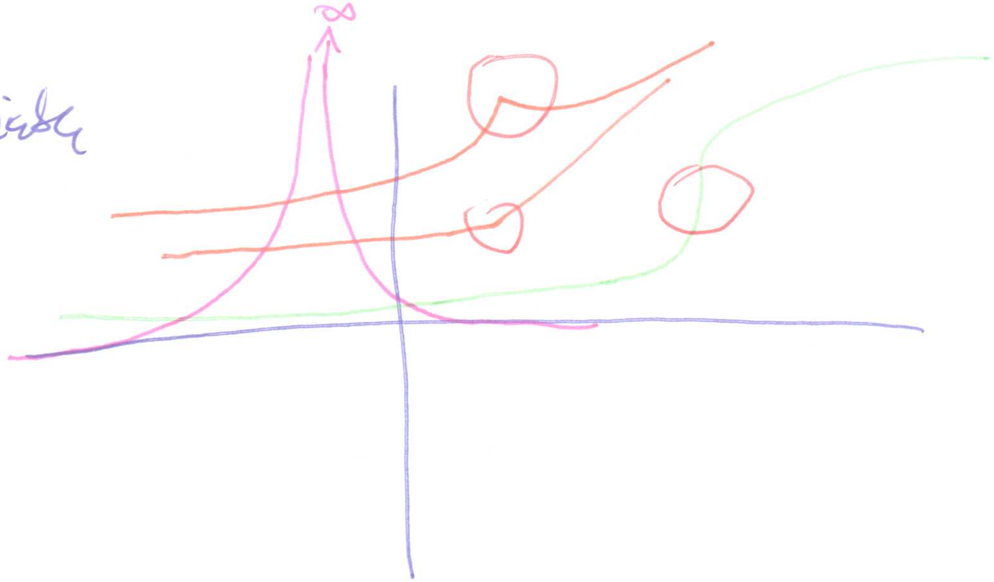
a) L is the slope of the tangent line to the graph of f at the point $(x_0, f(x_0))$

b) We say that f is differentiable at x_0

c) L is called the value of the derivative of f at x_0: $f'(x_0)$, $\frac{d}{dx} f \Big|_{x = x_0}$

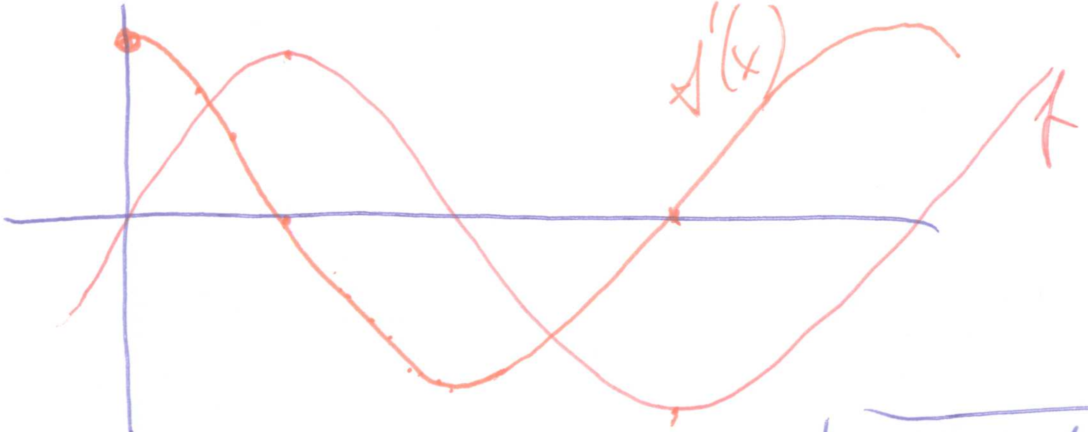
Note: If f is not continuous at x_0, then the limit cannot exist

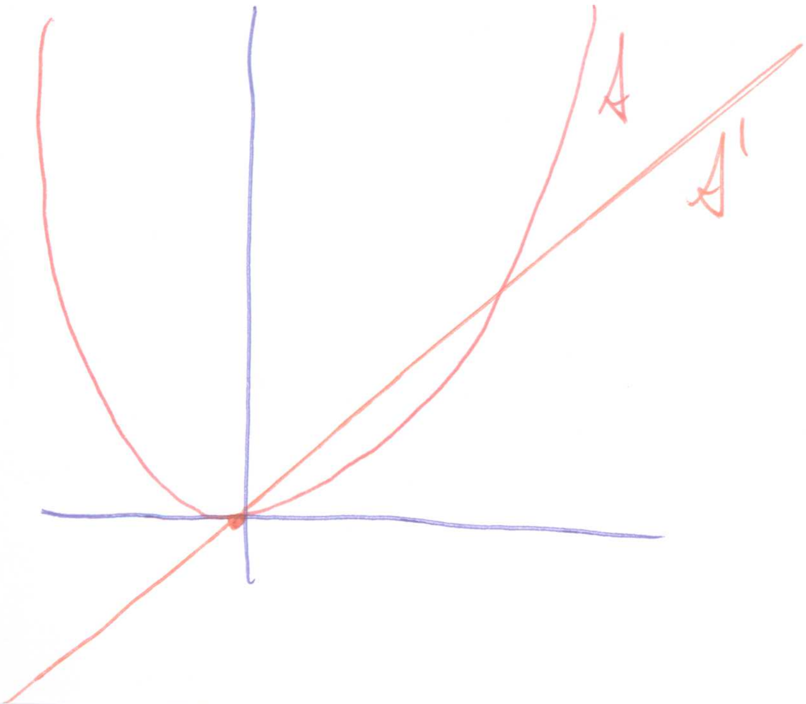
Ex: f is not differentiable



If f is differentiable at every point. Make a new fct:

$f' : x \mapsto f'(x)$ $f' = \frac{d}{dx} f$





Formulas for the derivative.

$f(x)$	$f'(x)$
$1 \cdot x^0$	0
x	1
$n \in \mathbb{R}$ x^n	$n \cdot x^{n-1}$
$a_0 + a_1 x + a_2 x^2 + \dots + a_n x^n$	$0 + a_1 \cdot 1 + 2a_2 x^{1} + 3a_3 x^2 + \dots + n \cdot a_n \cdot x^{n-1}$