11.4 $f(x) = \dfrac{4x}{x^2-4}$, $x \neq \pm 2$

a) $f'(x) = \dfrac{4\cdot(x^2-4) - 4x\cdot 2x}{(x^2-4)^2} = \underline{\dfrac{-4x^2-16}{(x^2-4)^2}}$

b) $f'(0) = \dfrac{-4\cdot 0^2-16}{(0^2-4)^2} = \dfrac{-16}{16} = \underline{-1}$

11.9 $r(x) = \dfrac{2-x}{x^3}$, $x \neq 0$

$r'(x) = \dfrac{-1\cdot x^3 - (2-x)\cdot 3x^2}{(x^3)^2} = \dfrac{2x^3-6x^2}{x^6} = \dfrac{x^2(2x-6)}{x^6}$

$= \dfrac{2x-6}{x^4} = 0 \quad | \cdot x^4$

$\Leftrightarrow 2x-6=0 \Leftrightarrow 2x=6 \Leftrightarrow \underline{x=3}$

11.17 $g(x) = \dfrac{x^3}{\underbrace{x^2+5}_{\geq 0}}$ nimittäjä $\neq 0$ aina $\Rightarrow x \in \mathbb{R}$

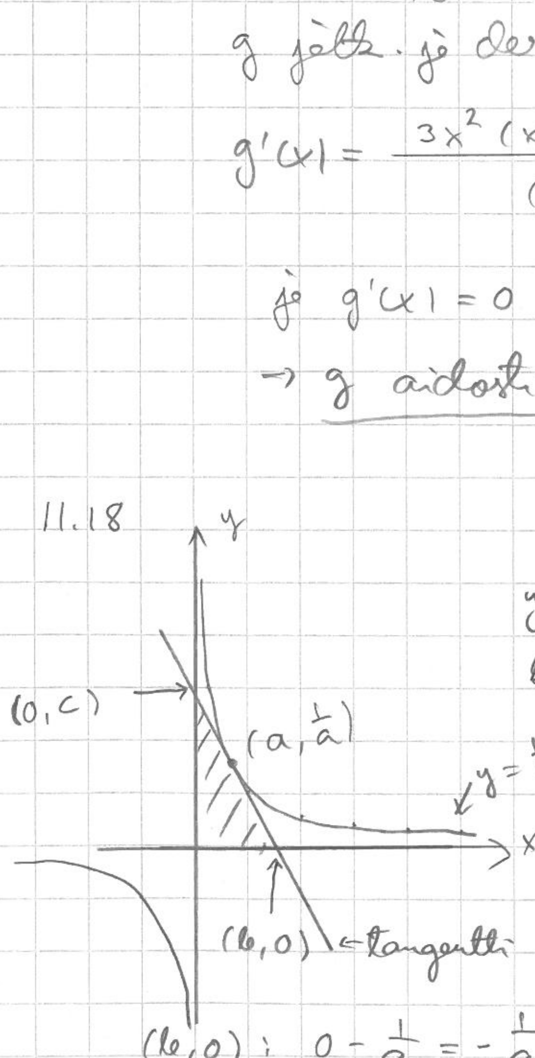
g jatk. ja deriv. $\mathbb{R}$:ssä

$g'(x) = \dfrac{3x^2(x^2+5) - x^3\cdot 2x}{(x^2+5)^2} = \dfrac{\overbrace{x^4}^{\geq 0} + \overbrace{15x^2}^{\geq 0}}{\underbrace{(x^2+5)^2}_{>0}} \geq 0$ aina

ja $g'(x)=0$ vain kun $x=0$ (terassikohta)

$\rightarrow$ g aidosti kasvava $\mathbb{R}$:ssä

11.18



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

$y' = \dfrac{0\cdot x - 1\cdot 1}{x^2} = -\dfrac{1}{x^2}$

$k_t = y'(a) = -\dfrac{1}{a^2}$

Γ piste: (x_0, y_0)
kulmakerroin: k
$\rightarrow$ suora: $\boxed{y - y_0 = k(x-x_0)}$

x	$y = \frac{1}{x}$
1	1
2	$\frac{1}{2}$
3	$\frac{1}{3}$
4	$\frac{1}{4}$
5	$\frac{1}{5}$
$\frac{1}{2}$	2
$\frac{1}{3}$	3

← tangentti

tangentti:

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

$(b,0)$: $0 - \frac{1}{a} = -\frac{1}{a^2}(b-a) \quad | \cdot(-a^2) \Leftrightarrow a = b-a \Leftrightarrow b = 2a$

$(0,c)$: $c - \frac{1}{a} = -\frac{1}{a^2}(0-a) \Leftrightarrow c - \frac{1}{a} = \frac{1}{a} \Leftrightarrow c = \frac{1}{a} + \frac{1}{a} = \frac{2}{a}$