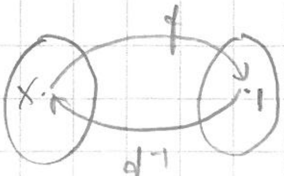


$f(x) = x^3 + x + 3 = 1 \iff x = -1$

$(f^{-1})'(1) = \dfrac{1}{f'(-1)} = \dfrac{1}{3 \cdot (-1)^2 + 1} = \underline{\dfrac{1}{4}}$

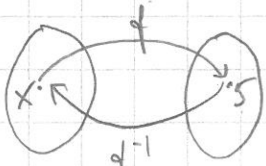
$f(x) = x^3 + x + 3 = -7 \iff x = -2$

$(f^{-1})'(-7) = \dfrac{1}{f'(-2)} = \dfrac{1}{3 \cdot (-2)^2 + 1} = \underline{\dfrac{1}{13}}$

7.17 $f(x) = \ln x + 2x + 3$

⌈ $f(x) = \ln x + 2x + 3 = y \iff x = \ldots = f^{-1}(y)$

liian paha → ei onnistu ⌋



$f(x) = \ln x + 2x + 3 = 5 \iff x = 1$

$f'(x) = \dfrac{1}{x} + 2$

$k_t = (f^{-1})'(5) = \dfrac{1}{f'(1)} = \dfrac{1}{\frac{1}{1} + 2} = \dfrac{1}{3}$

piste : $(5, 1)$

tangentti : $y - 1 = \dfrac{1}{3}(x - 5) \iff \underline{y = \dfrac{1}{3}x - \dfrac{2}{3}}$

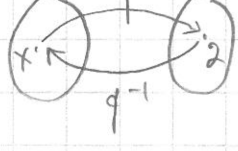
7.19 $f(x) = \ln x + x + 1$, $x > 0$

a) f jatk. ja deriv. kun $x > 0$

$f'(x) = \underbrace{\dfrac{1}{x}}_{>0} + 1 > 0$ aina kun $x > 0$ $\Rightarrow f$ aidosti kasvava

$\Rightarrow$ käänteisfunktio $f^{-1} = g$ on olemassa

b)



$f(x) = \ln x + x + 1 = 2 \iff x = 1$

$g'(2) = (f^{-1})'(2) = \dfrac{1}{f'(1)} = \dfrac{1}{\frac{1}{1} + 1} = \underline{\dfrac{1}{2}}$

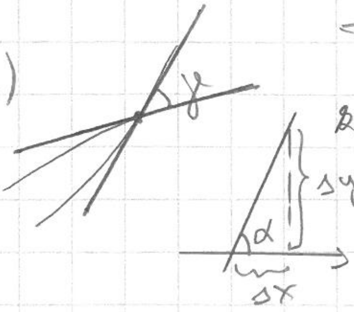
c) f:n ja f^{-1}:n kuvaajat ovat toistensa peilikuvia suoran $y = x$ suhteen $\Rightarrow$ niiden leikkauspisteet ovat suoralla $y = x$

$\begin{cases} y = f(x) = \ln x + x + 1 \\ y = x \end{cases} \Rightarrow \ln x + x + 1 = x \iff \ln x = -1 \quad | e^{()}$

$\iff e^{\ln x} = e^{-1} \iff x = e^{-1} = \dfrac{1}{e}$

$\Rightarrow$ leikkauspiste : $\underline{\left(\dfrac{1}{e}, \dfrac{1}{e}\right)}$

d)



$k_{t_1} = f'\left(\dfrac{1}{e}\right) = \dfrac{1}{\frac{1}{e}} + 1 = e + 1 = \tan\alpha \Rightarrow \alpha \approx 74{,}95^\circ$

$k_{t_2} = (f^{-1})'\left(\dfrac{1}{e}\right) = \dfrac{1}{f'\left(\frac{1}{e}\right)} = \dfrac{1}{e+1} = \tan\beta \approx 15{,}05^\circ$

$\Rightarrow \gamma = \alpha - \beta \approx \underline{59{,}9^\circ}$