

MAA8 mallikoe

1. a) $2 \cdot -\frac{3}{7} x^{-\frac{10}{7}} = -\frac{6}{7} x^{-\frac{10}{7}}$

b) $\frac{1}{\sqrt{x^2+1}} \cdot \frac{1}{\sqrt{x^2+1}} = \frac{1}{\sqrt{x^2+1}} \cdot \frac{1}{2} (x^2+1)^{-\frac{1}{2}} \cdot 2x$

$= \frac{x}{\sqrt{x^2+1} \sqrt{x^2+1}} = \frac{x}{x^2+1}$

c) Pelletin sievennys! $\frac{1}{4} (e^{2x} + 2e^x e^{-x} + e^{-2x} - e^{2x} + 2e^x e^{-x} - e^{-2x}) = 1$

4. $-2,3\% \rightarrow$ jäljelle jää $97,7\% = 0,977$

$a = \text{raja}$

$10 \cdot 0,977^x = 1 \rightarrow 10 \cdot 0,977^x = 1 \rightarrow$

$$0,977^x = 0,1 \quad || \lg$$

$$x = \frac{\lg 0,1}{\lg 0,977} \approx 99 \quad (a)$$

$$b) \quad 0,977^x = 0,5 \quad || \lg$$

$$x = \frac{\lg 0,5}{\lg 0,977} \approx 30 \quad (a)$$

$$2. \quad f(x) = x^2 \ln x, \quad x > 0$$

$$f'(x) = 2x \ln x + x^2 \cdot \frac{1}{x} = x(2 \ln x + 1) = 0 \rightarrow x = 0$$

$$\text{fazi} \quad 2 \ln x + 1 = 0$$

$$\ln x = -\frac{1}{2}$$

$$x = e^{-\frac{1}{2}} = \frac{1}{\sqrt{e}} \approx 0,6$$

	0	0,5	$\frac{1}{\sqrt{e}}$	1
f'		-	+	
f		$\searrow$	$\nearrow$	

prenin arva = $f\left(\frac{1}{\sqrt{e}}\right) \approx \dots$

$$5. \quad 5^{2006} = 10^{\lg 5^{2006}} = 10^{2006 \cdot \lg 5} =$$

$$10^{\lg 5} \cdot 10^{2006} = 5 \cdot 10^{2006}$$

2007 numeroa, päättyy nolkaan.

$$6. \quad a) \quad 5^{5x-5} = 5^5$$

$$5x-5=5$$

$$x=2$$

$$b) \quad 2 \log_3 6 - \log_3 4 = \log_3 36 - \log_3 4 = \log_3 \frac{36}{4}$$

$$= \log_3 3^2 = 2 \log_3 3 = 2$$

$$c) \quad \underline{x > 0} \text{ ja } x > -30 : \lg(x(x+30)) = 3 \rightarrow x^2 + 30x = 10^3$$

$\rightarrow$ ratk. kaavalla ...

$$b) \quad f'(x) = \frac{1}{x+1} - \frac{1}{x} = 0$$

$$\rightarrow \frac{1}{x+1} = \frac{1}{x}$$

$$\rightarrow x+1 = x$$

$$0 = 1 \quad \text{ei ratke.}$$



V: on aidosti monotoninen

$$\begin{aligned}
 9. \quad b) \quad \frac{1}{2} D(e^x - e^{-x}) &= \frac{1}{2} (e^x - e^{-x}(-1)) \\
 &= \frac{1}{2} (e^x + e^{-x}) \\
 &= \cosh x \quad \square.
 \end{aligned}$$

a) knuten 1c.