24.6

$$f(t) = \frac{e^{(2,4-t)^2} + t + 30}{e^{(2,4-t)^2}}$$

$\left[\; De^x = e^x \right.$

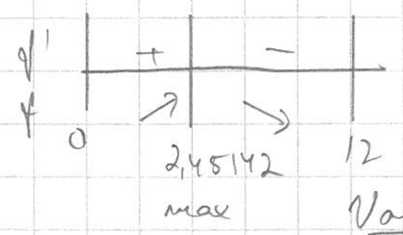
$De^{f(x)} = e^{f(x)} \cdot f'(x)$

$D\frac{f}{g} = \frac{f'g - fg'}{g^2} \left.\right]$

$f$ jatk. ja deriv. väl. $[0, 12]$

$$f'(x) = \frac{-(10x^2 + 27(x - 725)\, e^{-x^2 + \frac{24x}{5} - \frac{144}{25}}}{5} \quad \text{(TI-nspire)}$$

$$= 0 \iff x \approx \begin{cases} -30,0154 \\ 2,45142 \end{cases} \quad \text{(TI-nspire)}$$

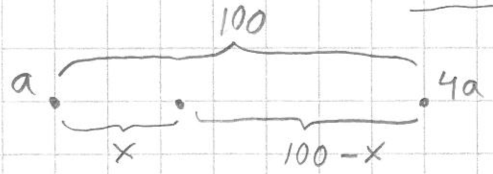



$f'(1) \approx 12,4 > 0$

$f'(3) \approx -26,9 < 0$

Vast. $t \approx 2,45$ eli maksimum puolivälin tienoille jolloin eliöitä oli n. $f(2,45) \approx \underline{33,4}$ tuhatta eliötä

24.16




Tuhovaikutus yhteensä:

$$f(x) = ae^{-x} + 4ae^{-(100-x)}$$

$$= \underbrace{a}_{>0 \text{ vakio}}\underbrace{(e^{-x} + 4e^{x-100})}_{= g(x)}$$

$f(x)$ on pienin kun $g(x)$ on pienin,

$g$ jatk. ja deriv. väl. $[0, 100]$

$$g'(x) = e^{-x}\cdot(-1) + 4e^{x-100}\cdot 1 = -e^{-x} + 4e^{x-100} = 0$$

$$\iff 4e^{x-100} = e^{-x} \quad | \ln$$

$$\iff \ln(4e^{x-100}) = \ln e^{-x}$$

$$\iff \ln 4 + \cancel{\ln e}^{\,x-100} = \cancel{\ln e}^{\,-x}$$

$$\iff \ln 4 + (x - 100) = -x \iff x = 50 - \ln 2 \approx 49,3$$