

Opgave 6.1.43

Pollution A marshy region used for agricultural drainage has become contaminated with selenium. It has been determined that flushing the area with clean water will reduce the selenium for a while, but it will then begin to build up again. A biologist has found that the percent of selenium in the soil x months after the flushing begins is given by

$$f(x) = \frac{x^2 + 36}{2x}, \quad 1 \leq x \leq 12$$

When will the selenium be reduced to a minimum? What is the minimum percent?

– s. 372

Opstil funktion

$$f(x) = \frac{f(x)}{g(x)}, \quad 1 \leq x \leq 12$$

Opstil indre funktioner

$$\begin{aligned} f(x) &= x^2 + 36 \Leftrightarrow f'(x) = 2x \\ g(x) &= 2x \Leftrightarrow g'(x) = 2 \end{aligned}$$

Differentier

$$\begin{aligned} f'(x) &= \frac{f'(x) \cdot g(x) - f(x) \cdot g'(x)}{(g(x))^2} \\ f'(x) &= \frac{2x \cdot 2x - (x^2 + 36) \cdot 2}{4x^2} \\ f'(x) &= \frac{4x^2 - 2x^2 - 72}{4x^2} \\ f'(x) &= \frac{2x^2 - 72}{4x^2} && : \text{Divider med 2} \\ f'(x) &= \frac{x^2 - 36}{2x^2} \end{aligned}$$

Løs for 0

$$\begin{aligned} f'(x) = 0 &= \frac{x^2 - 36}{2x^2} \\ 0 \cdot (2x^2) &= x^2 - 36 \\ 0 &= x^2 - 36 \\ 36 &= x^2 \\ \sqrt{36} &= x \\ x &= 6 \vee x = -6 \end{aligned}$$

Da x skal være mellem 1 og 12, så får vi følgende løsning

$$x = 6$$

Indsæt 6 i $f(x)$

$$f(6) = 6$$

Så derfor finder vi frem tid at mindste procent af selenium er 6%