

Opgave 9.2.63

Zooplankton Growth The rate that zooplankton consume phytoplankton has been described by the equation

$$C(x, y) = \frac{k}{a + (x - by)^2}$$

where a , b , and k are constants, and x and y represent the cell size of zooplankton and phytoplankton, respectively. Source: The American Naturalist. Calculate $C_x(x, y)$ and $C_y(x, y)$. What do you notice about the signs of $C_x(x, y)$ and $C_y(x, y)$? Explain why this makes sense.

— s. 533

Opskriv funktionen

$$\begin{aligned} C(x, y) &= \frac{k}{a + (x - by)^2} \\ &= k(a + (x - by)^2)^{-1} \end{aligned}$$

Find $C_x(x, y)$

$$C_x(x, y) = (f(g(x)))' = f'(g(x)) \cdot g'(x)$$

$$g(x) = a + (x - by)^2$$

$$f'(x) = -k(g(x))^{-2}$$

$$g'(x) = 2(x - by)$$

$$C_x(x, y) = -k(a + (x - by)^2)^{-2} \cdot 2(x - by)$$

$$C_x(x, y) = -\frac{2k(x - by)}{(a + (x - by)^2)^2}$$

Find $C_y(x, y)$

$$f(u) = k(u)^{-1} \Leftrightarrow -k(u)^{-2}$$

$$g(x, y) = a + (x - by)^2 \Leftrightarrow g_y(x, y) = 2(x - by) \cdot (-b)$$

$$C_y(x, y) = -k(a + (x - by)^2)^{-2} \cdot 2(x - by) \cdot (-b)$$

$$= \frac{2kb(x - by)}{(a + (x - by)^2)^2}$$