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Calculus alpha

Aflevering uge 4

Opgave 9.3.39

> Suppose the labor cost (in dollars) for manufac- turing a medical device can be approximated by
>
> $$L(x,y) = \frac{3}{2}x^2 + y^2 - 2x - 2y - 2xy + 68$$
>
> where x is the number of hours required by a skilled craftsper son and y is the number of hours required by a semiskilled per son. Find values of x and y that minimize the labor cost. Find the minimum labor cost
>
> — s. 544

Find afledte funktioner for henholdsvis x og y

$$L_x(x,y) = 3x - 2y - 2$$
$$L_y(x,y) = 2y - 2x - 2$$

Opstil lignings system

$$\begin{aligned} \text{I:} \quad & L_x(x,y) = 0 = 3x - 2y - 2 \\ \text{II:} \quad & L_y(x,y) = 0 = 2y - 2x - 2 \end{aligned}$$

Isoler x II

$$\begin{aligned} 0 &= 2y - 2x - 2 \\ 2x &= 2y - 2 \\ x &= y - 1 \end{aligned}$$

Indsæt i I

$$\begin{aligned} &0 = 3x - 2y - 2 \\ &0 = 3(y-1) - 2y - 2 \\ &0 = 3y - 3 - 2y - 2 \\ &0 = y - 5 \\ &y = 5 \end{aligned}$$

Find x

$$\begin{aligned} x &= y - 1 \\ x &= 4 \end{aligned}$$

For at teste om det er et minimumspunkt skal vi bruge alle anden afledte funktioner

$$L_{xx} = 3$$
$$L_{yy} = 2$$
$$L_{xy} = 2$$

Ligning for diskriminanten

$$\begin{aligned} D &= L_{xx}(x,y) \cdot L_{yy}(x,y) - \left(L_{xy}(x,y)\right)^2 \\ &= 3 \cdot 2 - 2^2 \\ &= 2 \end{aligned}$$

Da D er positiv og L_{xx} er positiv må $(4, 5)$ være et minimum