Lineær regression afhænger af koordinatsystemet

Givet 4 punkter:

X	Y
1.26	1.4
5.58	2.82
8.94	3.52
10.3	4.82

> *restart*

> *with*(*Gym*) :

> *with*(*plots*) :

> $X := [1.26, 5.58, 8.94, 10.3]$

$$X := [1.26, 5.58, 8.94, 10.3] \quad (1)$$

> $Y := [1.4, 2.82, 3.52, 4.82]$

$$Y := [1.4, 2.82, 3.52, 4.82] \quad (2)$$

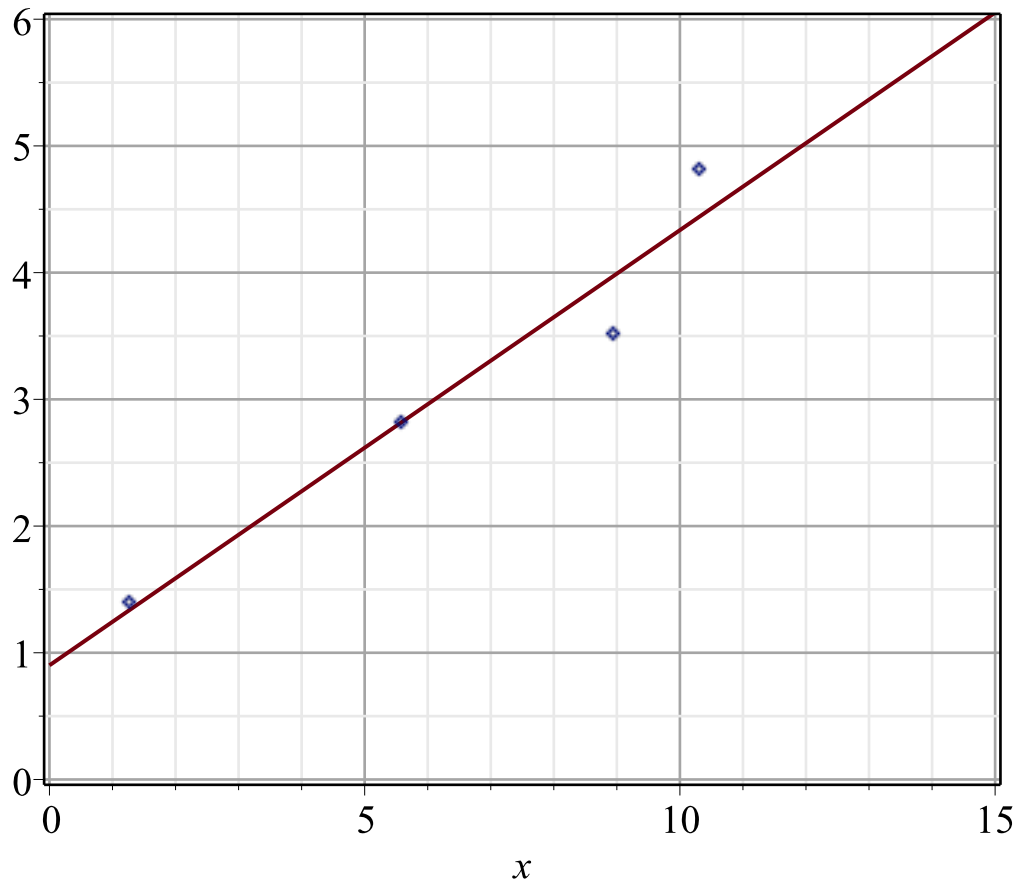
Lineær regression generelt ($y = a \cdot x + b$)

> *LinReg*(*X*, *Y*, *view* = [0 ..15, 0 ..6])

Lineær regression

y =0.34342 x + 0.90090.

Forklaringsgrad R^2 = 0.941984008416473



Forskriften:

> $f1 := unapply(LinReg(X, Y, x), x)$

$$f1 := x \rightarrow 0.3434204041399704\, x + 0.9008989650073933 \quad (1.1)$$

Punkterne drejes 60 grader om origo

http://en.wikipedia.org/wiki/Rotation_matrix

$$\begin{bmatrix} x' \\ y' \end{bmatrix} = \begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix}.$$

> $v := 60$

$$v := 60 \quad (2.1)$$

> $Cos(v)$

$$0.5000000000 \quad (2.2)$$

> $Sin(v)$

$$0.8660254040 \quad (2.3)$$

> $Xny := [0, 0, 0, 0]$

$$Xny := [0, 0, 0, 0] \quad (2.4)$$

> $Yny := [0, 0, 0, 0]$

$$Yny := [0, 0, 0, 0] \quad (2.5)$$

```
> for i from 1 to 4 do
    Xny[i] := Cos(v)·X[i]-Sin(v)·Y[i];
    Yny[i] := Sin(v)·X[i] + Cos(v)·Y[i]
  end do:
```

Koordinaterne for de 4 drejede punkter:

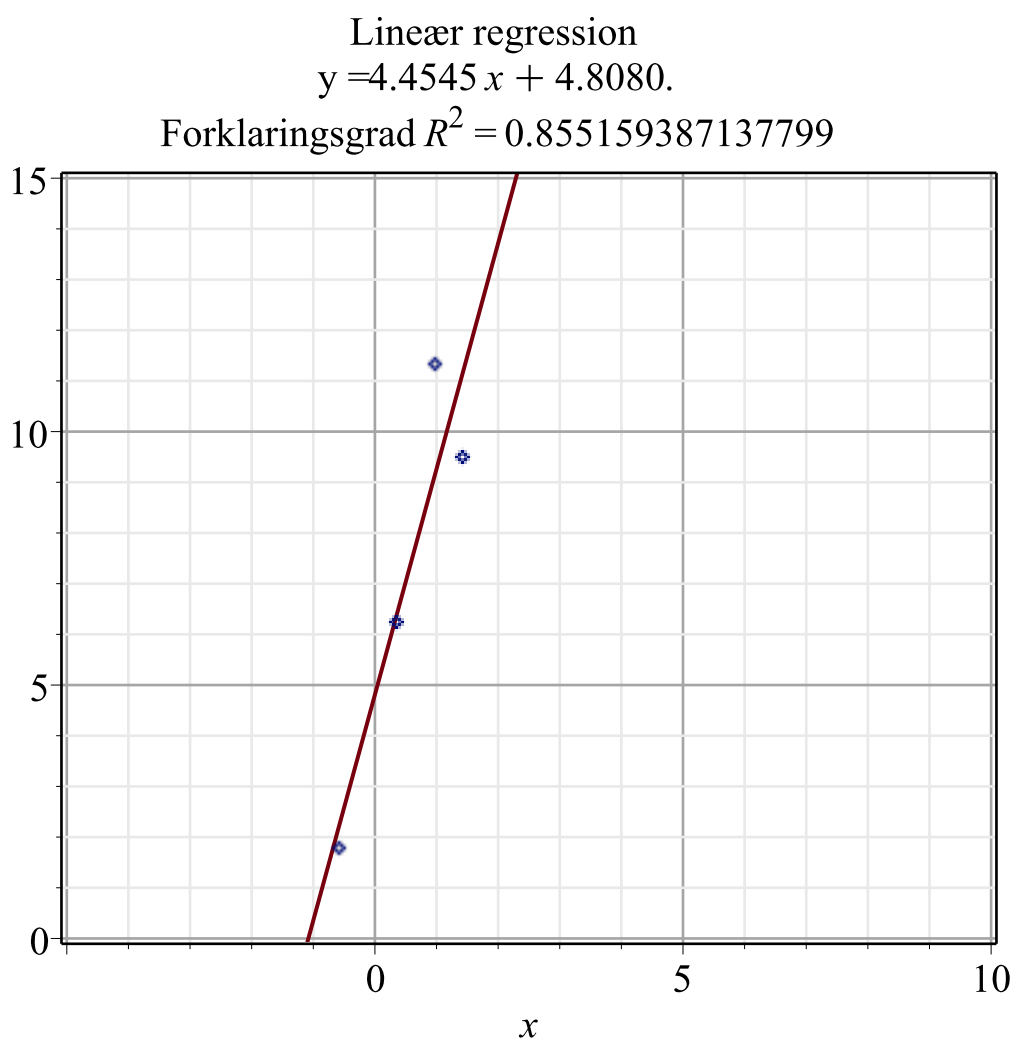
> Xny

$$[-0.5824355660, 0.347808361, 1.421590578, 0.975757553] \quad (2.6)$$

> Yny

$$[1.791192009, 6.242421754, 9.502267112, 11.33006166] \quad (2.7)$$

> $LinReg(Xny, Yny, view = [-5..10, 0..15])$



> $f := unapply(LinReg(Xny, Yny, x), x)$

$$f := x \rightarrow 4.454466234833137\, x + 4.808043798691486 \quad \textbf{(2.8)}$$

Opskriver 2 punkter på den nye regressionslinje, og drejer disse tilbage (med vinklen $-v$):

> $XnyPunkter := [0, 2]$

$$XnyPunkter := [0, 2] \quad \textbf{(2.9)}$$

> $YnyPunkter := [f(0), f(2)]$

$$YnyPunkter := [4.80804379869149, 13.7169762683578] \quad \textbf{(2.10)}$$

> $XPunkter := [0, 0]$

$$XPunkter := [0, 0] \quad \textbf{(2.11)}$$

> $YPunkter := [0, 0]$

$$YPunkter := [0, 0] \quad \textbf{(2.12)}$$

> **for** i **from** 1 **to** 2 **do**
  $XPunkter[i] := Cos(-v) \cdot XnyPunkter[i] - Sin(-v) \cdot YnyPunkter[i];$
  $YPunkter[i] := Sin(-v) \cdot XnyPunkter[i] + Cos(-v) \cdot YnyPunkter[i]$
end do:

Hermed er koordinaterne på den tilbagedrejede nye regressionslinje:

> $XPunkter$

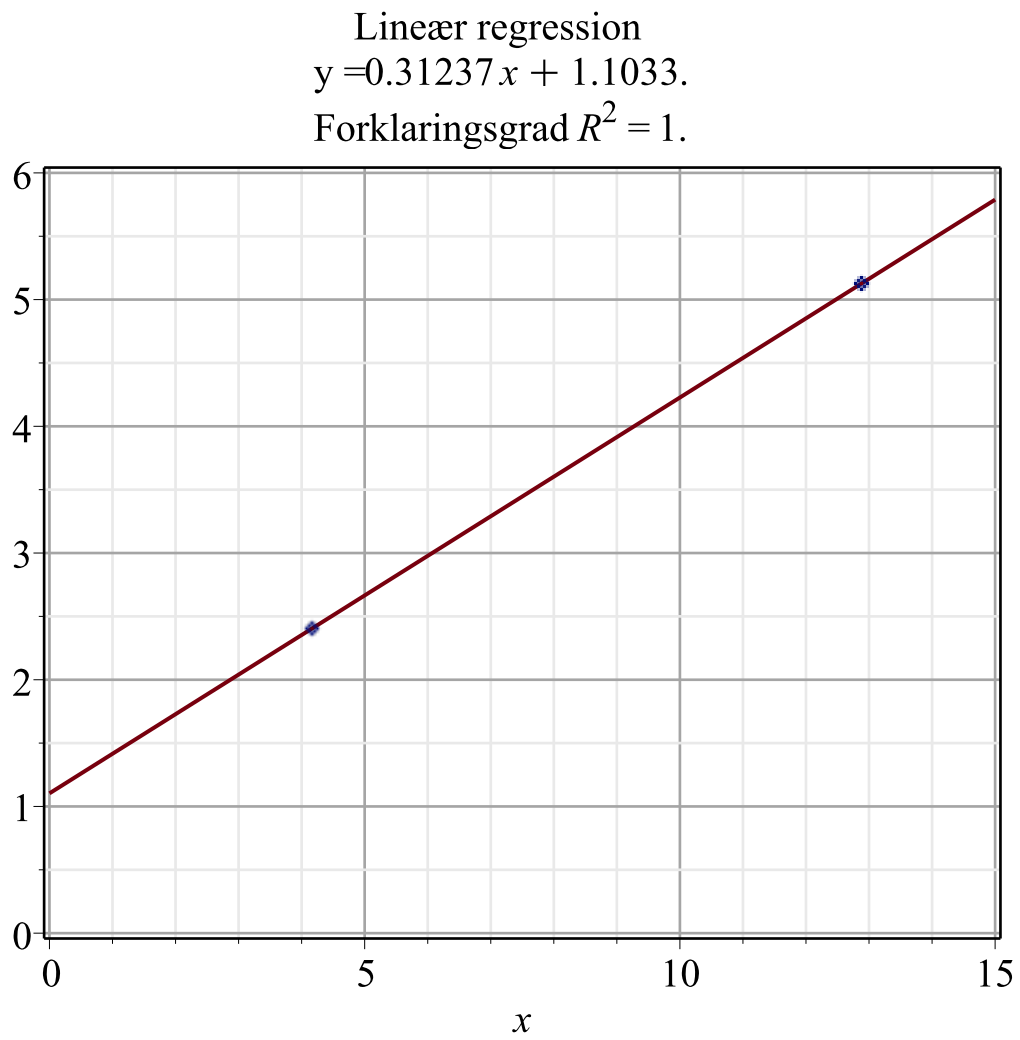
$$[4.16388807321149, 12.8792499144629] \quad \textbf{(2.13)}$$

> $YPunkter$

(2.14)

$$[2.40402189934574, 5.12643732617888] \quad \textbf{(2.14)}$$

> $LinReg(XPunkter, YPunkter, view = [0..15, 0..6])$



Forskriften:

> $f2 := unapply(LinReg(XPunkter, YPunkter, x), x)$

$$f2 := x \rightarrow 0.31236975313491067\, x + 1.1033492098352708 \quad \textbf{(2.15)}$$

Oprindelige regressionslinje:

> $f1(x)$

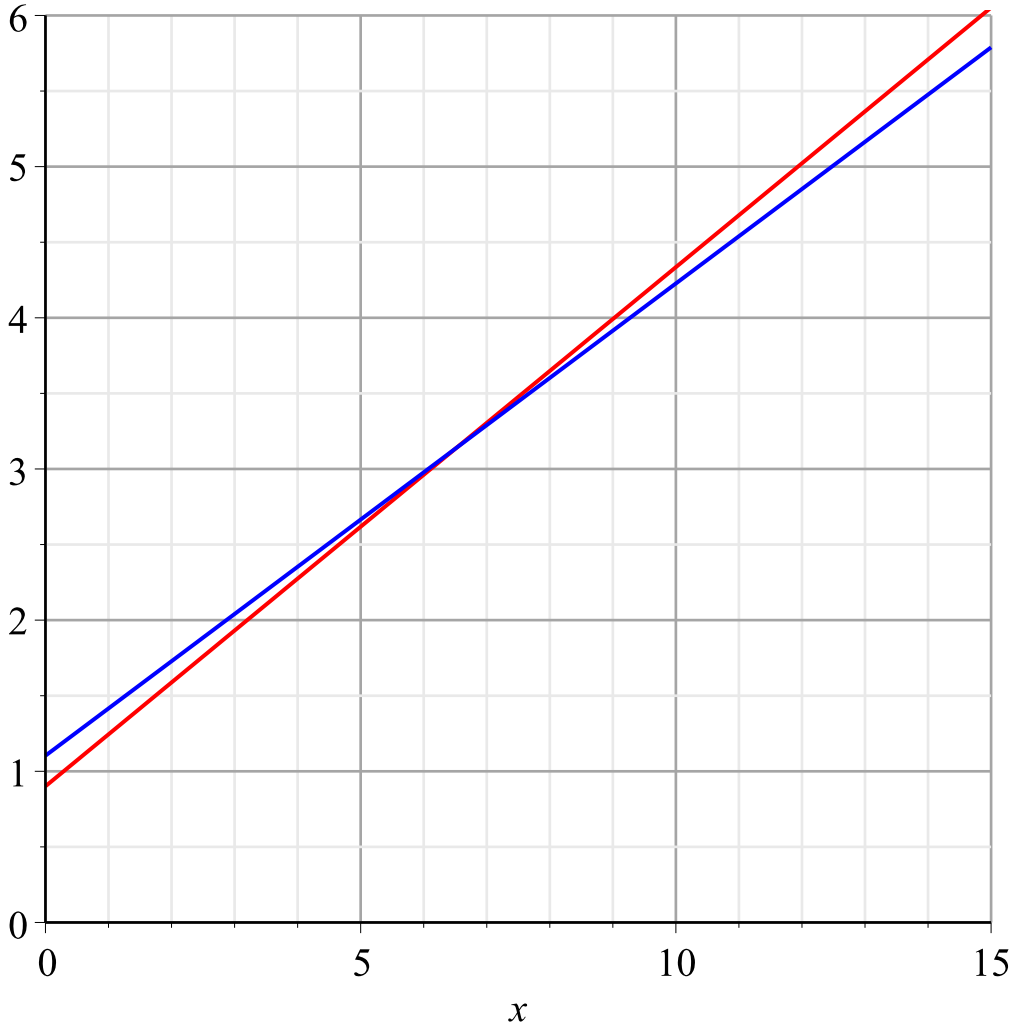
$$0.343420404139970\, x + 0.900898965007393 \quad \textbf{(2.16)}$$

Tilbagedrejede regressionslinje:

> $f2(x)$

$$0.312369753134911\, x + 1.10334920983527 \quad \textbf{(2.17)}$$

> $linje1 := plot(f1(x), x = 0..15, color = red) :$
> $linje2 := plot(f2(x), x = 0..15, color = blue) :$
> $display(linje1, linje2, view = [0..15, 0..6], gridlines)$



Linjerne er ikke identiske!

Konklusion:

Forskriften for regressionslinjen **afhænger** af koordinatsystemets valgte retning for x- og y-akserne.