


# Logarithmau 3

*Logarithms 3*



 @mathemateg

 /adolygumathemateg

# Ffitio Cromlinau / *Curve Fitting*

O gael gwerthoedd ar gyfer  $x$  ag  $y$ , efallai o arbrawf, mae'n bosib defnyddio logarithmau i weld os yw'r data'n ffitio perthynas o'r ffurf  $y = ax^n$  neu  $y = kb^x$ .

*Given values for  $x$  and  $y$ , possibly from an experiment, it is possible to use logarithms to see if the data fits a relationship of the form  $y = ax^n$  or  $y = kb^x$ .*

# Ffitio Cromlinau / Curve Fitting

(I) Ydi'r data o'r ffurf / *Is the data of the form  $y = ax^n$ ?*

$$y = ax^n$$

$$\log(y) = \log(ax^n)$$

Cymryd log (bôn 10) o bob ochr / *Taking logs (base 10) of each side*

$$\log(y) = \log(a) + \log(x^n)$$

Rheolau logarithm / *Rules of logarithms*

$$\log(y) = \log(a) + n \log(x)$$

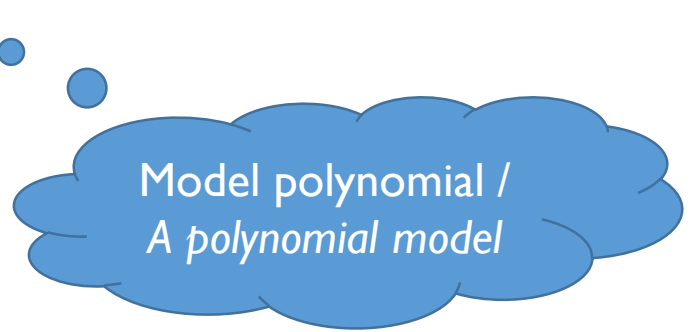
Rheolau logarithm / *Rules of logarithms*

$$\log(y) = n \log(x) + \log(a)$$

Ail-drefnu / *Re-arranging*

Yn cymharu efo / *comparing with  $y = mx + c$ ,*

byddai plotio  $\log(x)$  yn erbyn  $\log(y)$  yn rhoi llinell syth efo graddiant  $n$  a rhyngdoriad- $y$   $\log(a)$  / *plotting  $\log(x)$  against  $\log(y)$  would give a straight line with gradient  $n$  and  $y$ -intercept  $\log(a)$ .*



Model polynomial /  
A polynomial model

# Ffitio Cromlinau / Curve Fitting

## Enghraifft / Example

Casglwyd data mewn arbrawf am newidynnau  $x$  ag  $y$ .

Defnyddiwch y gwerthoedd data o'r tabl i ysgrifennu'r berthynas rhwng  $x$  ag  $y$  yn y ffurf  $y = ax^n$ .

*Data was collected in an experiment about the variables  $x$  and  $y$ .*

*Use the data values in the table to write the relationship between  $x$  and  $y$  in the form  $y = ax^n$ .*

$x$	10	20	30	40	50
$y$	158	549	1140	1913	2858

Gallwn ffurfio'r tabl isod i dangos gwerthoedd  $\log(x)$  a  $\log(y)$ , ac yna'u plotio ar ddiagram gwasgariad.

*We can form the following table to show the values of  $\log(x)$  and  $\log(y)$ , and then plot them on a scatter diagram.*

$\log(x)$	1	1.3010	1.4771	1.6021	1.6990
$\log(y)$	2.1987	2.7396	3.0569	3.2817	3.4561

# Ffitio Cromlinau / Curve Fitting

$\log(x)$	1	1.3010	1.4771	1.6021	1.6990
$\log(y)$	2.1987	2.7396	3.0569	3.2817	3.4561

Graddiant  $y$  graff  $yw$  tua / The gradient of the graph is approximately  $3.6 \div 2 = 1.8$ .

Rhyngdoriad- $y$   $y$  graff  $yw$  tua / The  $y$ -intercept of the graph is approximately 0.4.

Yn cymharu efo / Comparing with

$$\log(y) = n \log(x) + \log(a)$$

mae gennym / we have

$$\log(y) = 1.8 \log(x) + 0.4.$$

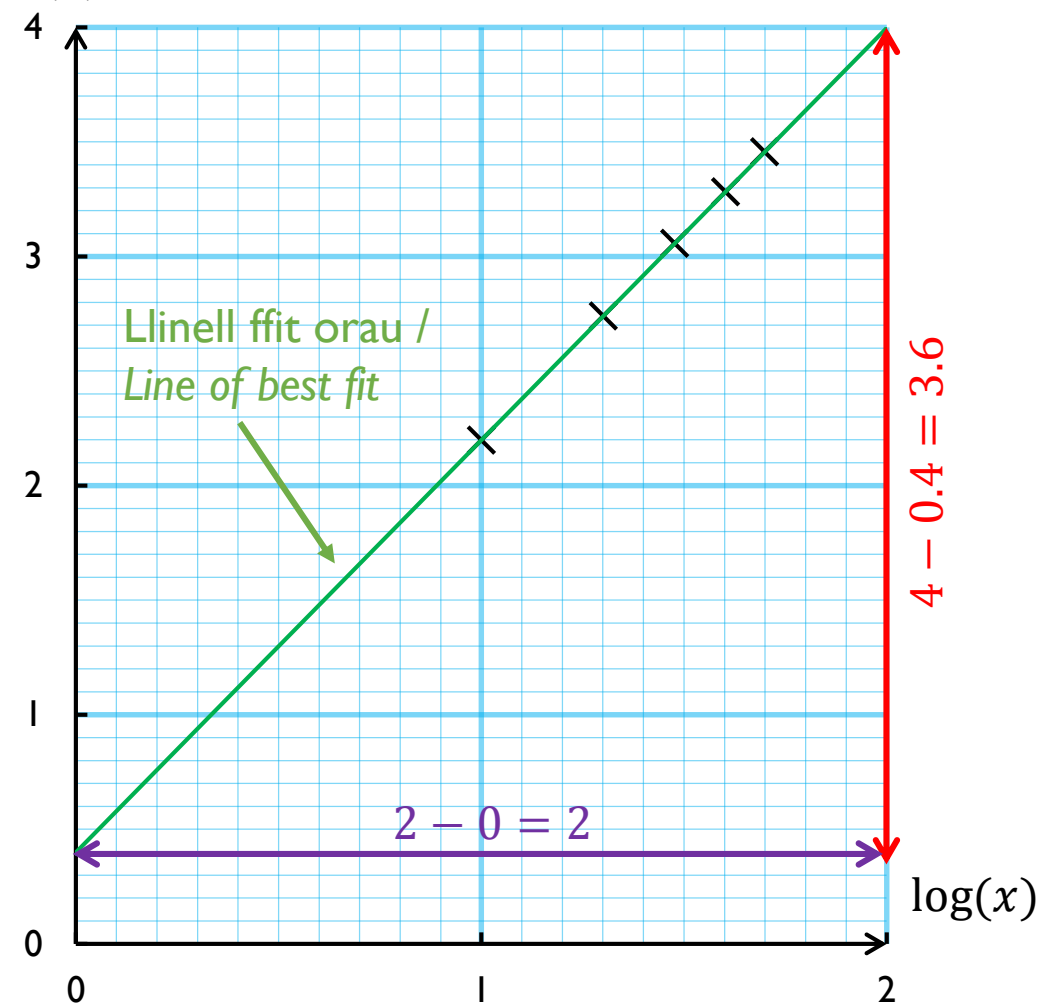
Felly / Therefore  $a = 10^{0.4}$

$a = 2.51$  (i 2 l.d. / to 2 d.p.).

Yn cymharu efo / Comparing with  $y = ax^n$

mae gennym  $y$  model / we have the model  $y = 2.51x^{1.8}$ .

$\log(y)$  Diagram Gwasgariad / Scatter Diagram



# Ffitio Cromlinau / Curve Fitting

(2) Ydi'r data o'r ffurf / Is the data of the form  $y = kb^x$ ?

$$y = kb^x$$

$$\log(y) = \log(kb^x)$$

Cymryd log (bôn 10) o bob ochr / Taking logs (base 10) of each side

$$\log(y) = \log(k) + \log(b^x)$$

Rheolau logarithm / Rules of logarithms

$$\log(y) = \log(k) + x \log(b)$$

Rheolau logarithm / Rules of logarithms

$$\log(y) = x \log(b) + \log(k)$$

Ail-drefnu / Re-arranging

Yn cymharu efo / comparing with  $y = mx + c$ ,

byddai plotio  $x$  yn erbyn  $\log(y)$  yn rhoi llinell syth efo graddiant  $\log(b)$  a rhyngdoriad- $y$   $\log(k)$  / plotting  $x$  against  $\log(y)$  would give a straight line with gradient  $\log(b)$  and  $y$ -intercept  $\log(k)$ .



Model ebonyddol /  
An exponential model

# Ffitio Cromlinau / Curve Fitting

## Enghraifft / Example

Casglwyd data mewn arbrawf am newidynnau  $x$  ag  $y$ .

Defnyddiwch y gwerthoedd data o'r tabl i ysgrifennu'r berthynas rhwng  $x$  ag  $y$  yn y ffurf  $y = kb^x$ .

*Data was collected in an experiment about the variables  $x$  and  $y$ .*

*Use the data values in the table to write the relationship between  $x$  and  $y$  in the form  $y = kb^x$ .*

$x$	2	4	6	8	10
$y$	9	53	306	1,761	10,145

Gallwn ffurfio'r tabl isod i dangos gwerthoedd  $x$  a  $\log(y)$ , ac yna'u plotio ar ddiagram gwasgariad.

*We can form the following table to show the values of  $x$  and  $\log(y)$ , and then plot them on a scatter diagram.*

$x$	2	4	6	8	10
$\log(y)$	0.9542	1.7243	2.4857	3.2458	4.0063

# Ffitio Cromlinau / Curve Fitting

$x$	2	4	6	8	10
$\log(y)$	0.9542	1.7243	2.4857	3.2458	4.0063

Graddiant  $y$  graff  $yw$  tua / The gradient of the graph is approximately  $3.8 \div 10 = 0.38$ .

Rhyngdoriad- $y$   $y$  graff  $yw$  tua / The  $y$ -intercept of the graph is approximately 0.2.

Yn cymharu efo / Comparing with

$$\log(y) = x \log(b) + \log(k)$$

mae gennym / we have

$$\log(y) = 0.38x + 0.2.$$

Felly / Therefore  $b = 10^{0.38}$        $k = 10^{0.2}$

$b = 2.40$  (i 2 l.d. / to 2 d.p.)       $k = 1.58$  (i 2 l.d. / to 2 d.p.)

Yn cymharu efo / Comparing with  $y = kb^x$

mae gennym  $y$  model / we have the model  $y = 1.58 \times 2.4^x$ .

$\log(y)$  Diagram Gwasgariad / Scatter Diagram

