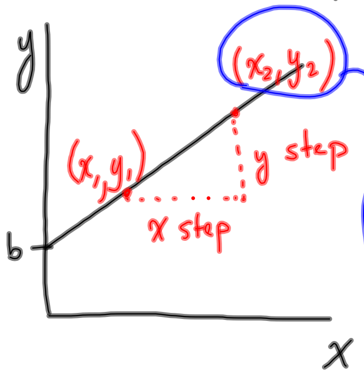
Interpretation of Linear Graphs

Consider a Linear Graph (where $b \neq 0$)



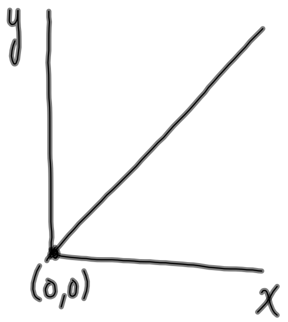
slope = $\frac{y \text{ step}}{x \text{ step}}$

slope (gradient) = $\frac{y_2 - y_1}{x_2 - x_1}$

$y = mx + b$

↑ solve for b

What if you have a linear relationship with $b = 0$?



We can say that there is a direct proportionality between y and x.

"y is directly proportional to x"

"y varies directly with x"

If you double x then y is doubled as well.

$y \propto x$ $\quad \propto$

proportionality statement

↑ "is proportional to"

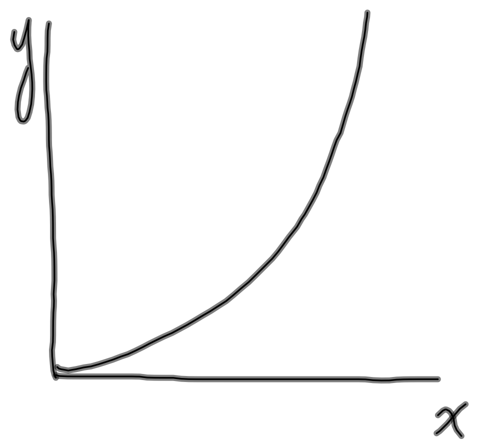
general equation $y = kx$.

$(y = mx + b)$

A graph of y vs x will be linear with a slope of k and a y-intercept of zero

Not all data you plot will give you a linear graph!

<u>Power Curve</u>

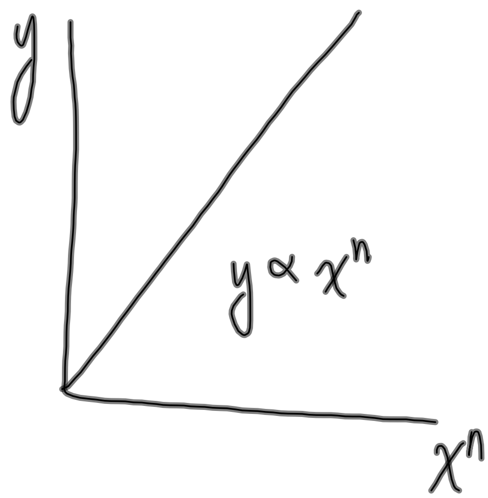


$y \propto x^n$

"y is proportional to x^n"

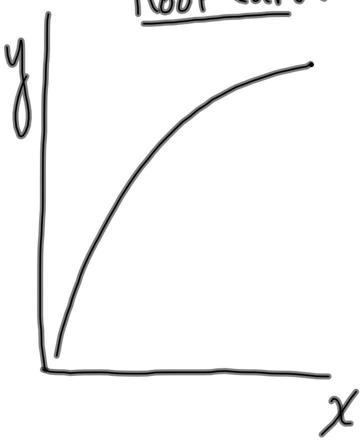
$y = kx^n$

$(y = mx + b)$



A graph of y vs x^n will be linear with a slope of k and a y-intercept of zero.

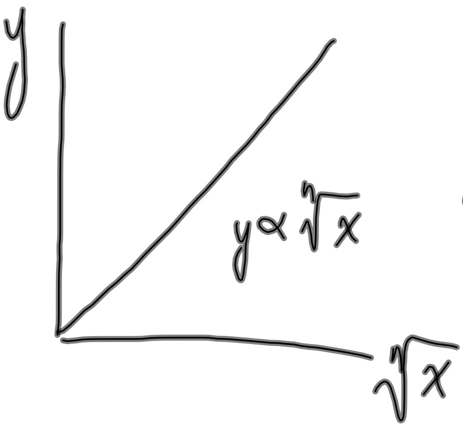
Root Curve



$y \propto \sqrt[n]{x}$ ← proportionality

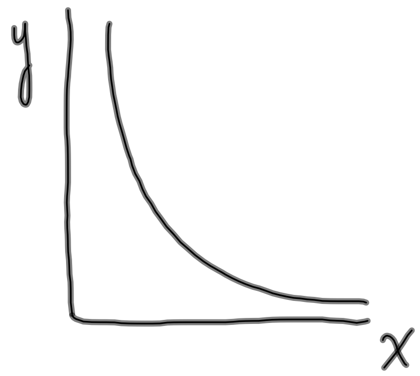
$y = k\sqrt[n]{x}$ ← general equation (k is the proportionality constant)

$y = m x + b$



A graph of y vs $\sqrt[n]{x}$ will be linear with a slope of k and a y-intercept of zero.

Inverse Curve



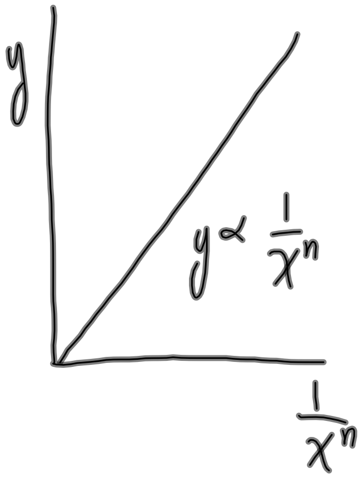
$y \propto \frac{1}{x^n}$

"y is inversely proportional to x^n"

"y is proportional to $\frac{1}{x^n}$"

$y = k\left(\frac{1}{x^n}\right)$

$y = m x + b$



(x^{-n})

A graph of y vs $\frac{1}{x^n}$ will linear with a slope of k and a y-intercept of zero.

Consider that you need to find the value for n:

$$y \propto x^n$$

$$y = kx^n$$

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

$$\log y = \log k + \log x^n$$

$$\log y = \log k + n \log x$$

$$(y = b + mx)$$

A graph of log y vs log x will be linear with a slope of n and a y-intercept of log k

Power: $y \propto x^n$

Root: $y \propto \sqrt[n]{x} \Rightarrow y \propto x^{\frac{1}{n}}$

Inverse: $y \propto \frac{1}{x^n} \Rightarrow y \propto x^{-n}$

Consider $T = 2\pi\sqrt{\frac{l}{g}}$ where g is constant.

$$T = \frac{2\pi}{\sqrt{g}}\sqrt{l}$$

$$y = m\ x + b$$

A graph of T vs $\sqrt{l}$ will be linear with a slope of $\frac{2\pi}{\sqrt{g}}$ and a y-intercept of zero