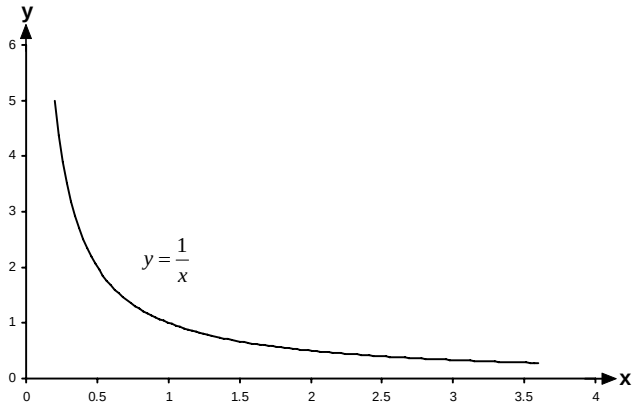
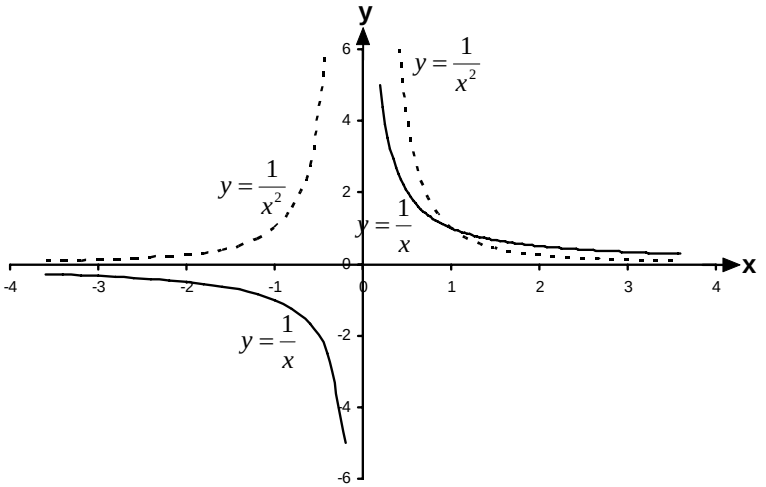
Inverse Relationships

Inverse relationships are all about one thing doing the opposite of the other. When one variable gets bigger, the other gets smaller, and vice versa. Here's the graph of a typical inverse relationship between x and y:



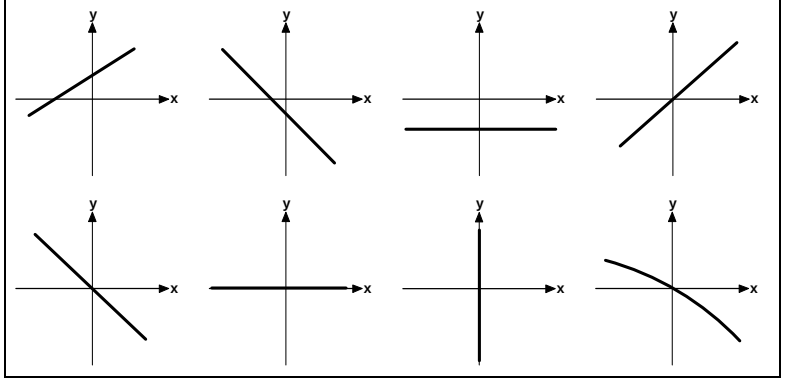
You can get inverse square $\left(y \propto \frac{1}{x^2}\right)$ or inverse cubic $\left(y \propto \frac{1}{x^3}\right)$ relationships too.



Spotting Them In Graphs

- In the area of the graph to the *right* of the y-axis, does one variable increase as the other variable decreases? The area of the graph to the *left* of the y-axis is a bit tricky – for $y = \frac{1}{x}$, as x decreases (goes more negative), y gets larger (becomes less negative). However, for $y = \frac{1}{x^2}$, as x decreases, y decreases too.
- Is the graph *undefined* at x = 0 (where the y-axis usually is)? This should happen regardless of what type of inverse relationship it is, because there's a divide by 'x' or divide by 'x^2' or something similar. Since x is zero, dividing by '0' gets you an undefined number. The value of 'y' near x = 0 should be either a very large positive number or a very large negative number.

Not inverse relationships



Spotting Them In Tables

If there is a power 1 inverse relationship $\left(y \propto \frac{1}{x}\right)$, then the product xy will be constant.

If there is a power 2 inverse relationship $\left(y \propto \frac{1}{x^2}\right)$, then the product x^2y will be constant.

x	1	2	4	8
y	64	16	4	1
xy	64	32	16	8
x^2y	64	64	64	64

The xy row doesn't have constant values along it, but the x^2y row does. This means that the relationship is an inverse squared relationship, y is inversely proportional to x^2:

$$y \propto \frac{1}{x^2}$$

Joint Variation

The most well known formula in the field of electricity is this simple one:

$$V = IR$$

Now, neither 'V', 'I' or 'R' are constants, they are all *variables* which can change their value. We would say that V varies directly as 'I' and directly as 'R'.

We could of course rearrange this equation to make 'R' the subject for instance:

$$R = \frac{V}{I}$$