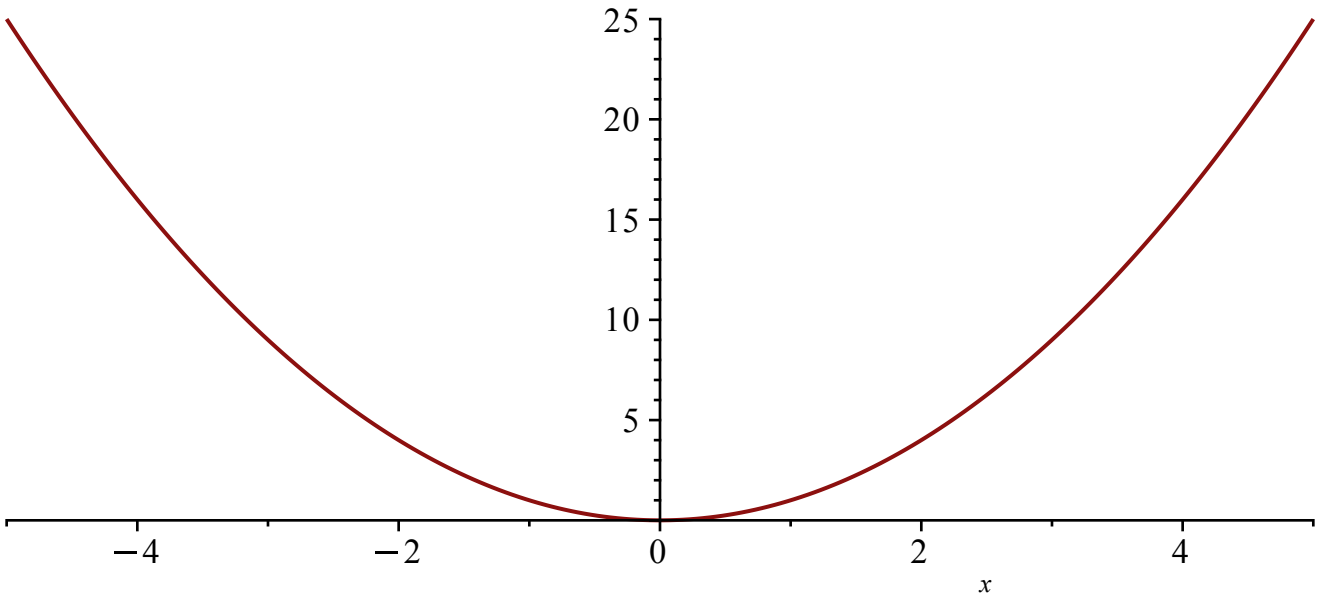
Maple Tutorial 2: 2D Plots

Simple Plot

Let's plot $y(x) = x^2$ on the domain $-5 < x < 5$. [Note: to prevent Maple from executing the equations on this line, I right-clicked (ctrl-clicked on Mac) each equation, and then unchecked the "Executable Math" box.) I adjusted the aspect ratio by clicking on the plot and then dragging the bottom edge of the plot window upward. In this example, we are plotting an expression (rather than a function).

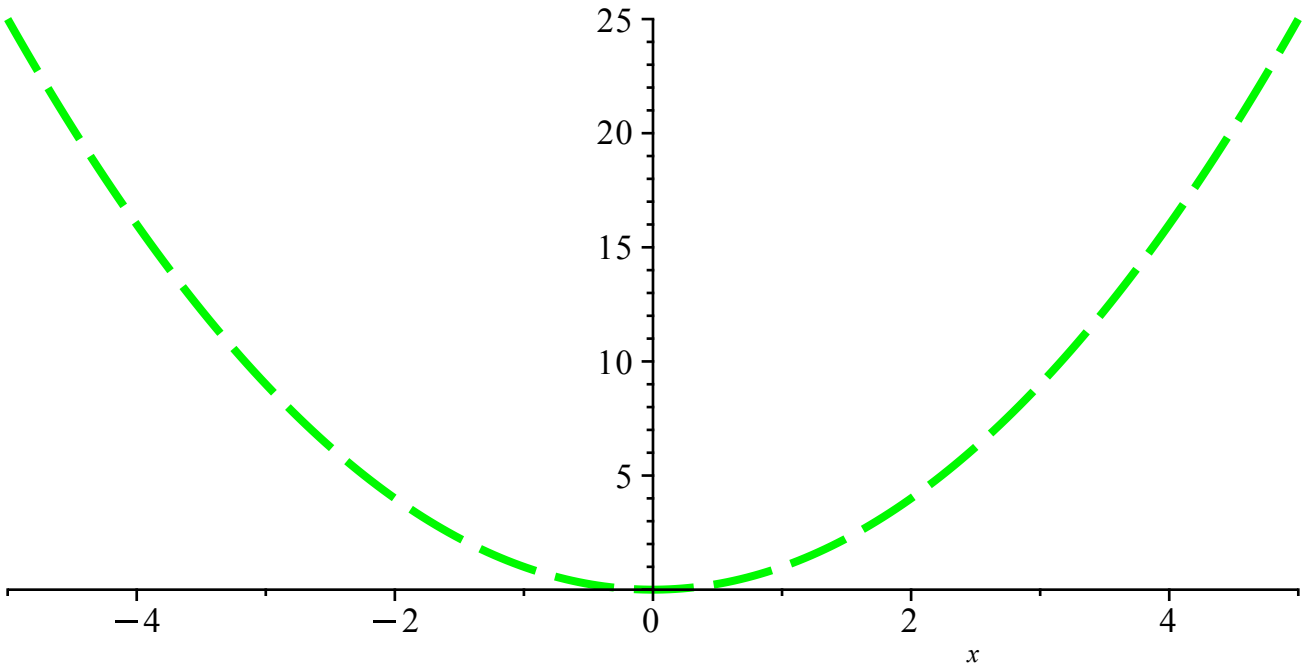
$plot(x^2, x = -5..5)$



Color, Line Width and Style

We can change the appearance of the plotted line using the options thickness, linestyle and color. Detailed lists of these parameters may be found on the MapleSoft website, or by right-clicking (ctrl-clicking on mac) the option in the command below.

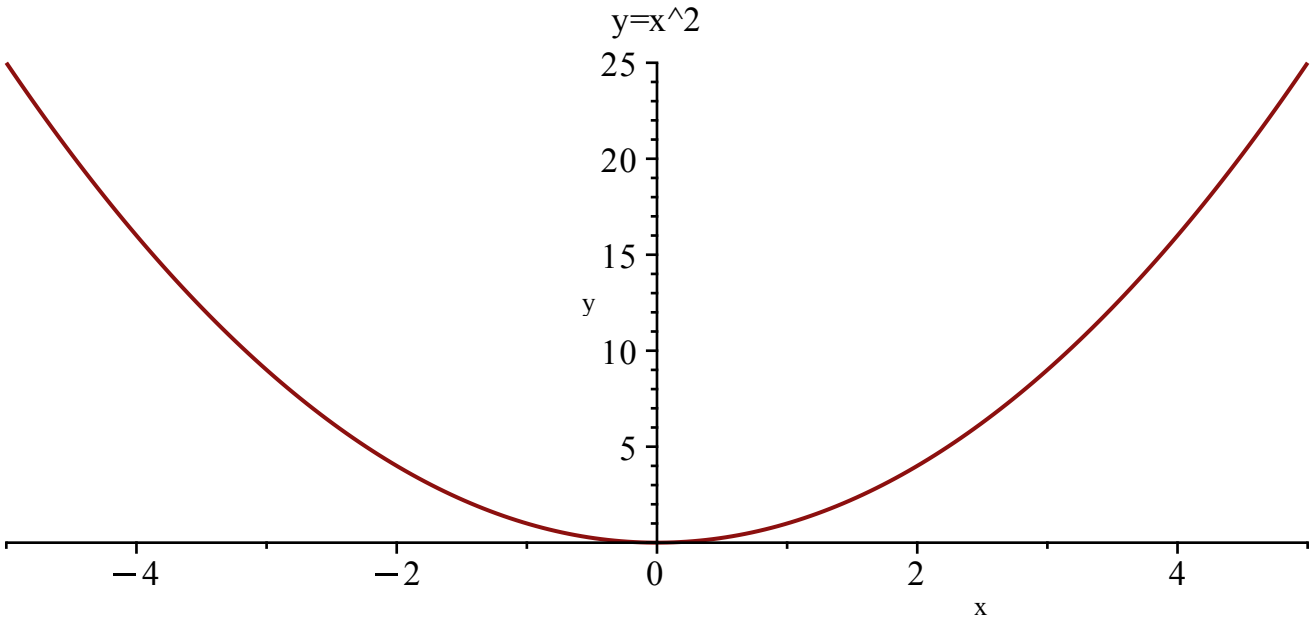
$plot(x^2, x = -5..5, thickness = 3, linestyle = dash, color = green)$



Label Axes and Title

We use the labels and title options and place the text that we want to display in quotes.

$plot(x^2, x=-5..5, labels=["x","y"], title="y=x^2")$

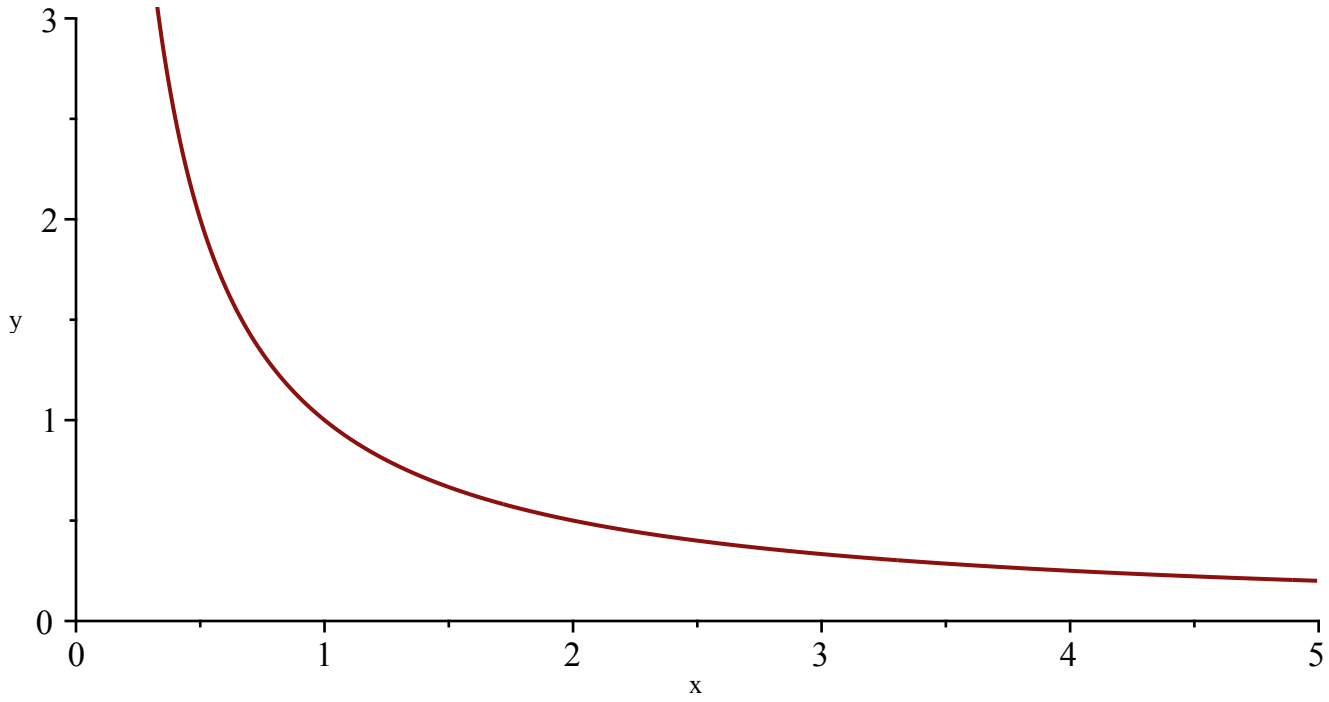


Set x and y limits

In the previous examples, we specified the plotting limits along the horizontal axis and let Maple set the vertical plot limits automatically. In this example, we specify both the horizontal plot limits $0 \le y \le 5$ and vertical plot limits $0 \le y \le 3$ by specifying x=0..5,0..3 in the plot command. The first range (0..5)

sets the horizontal plot limit and the second range (0..5) sets the vertical plot limit.

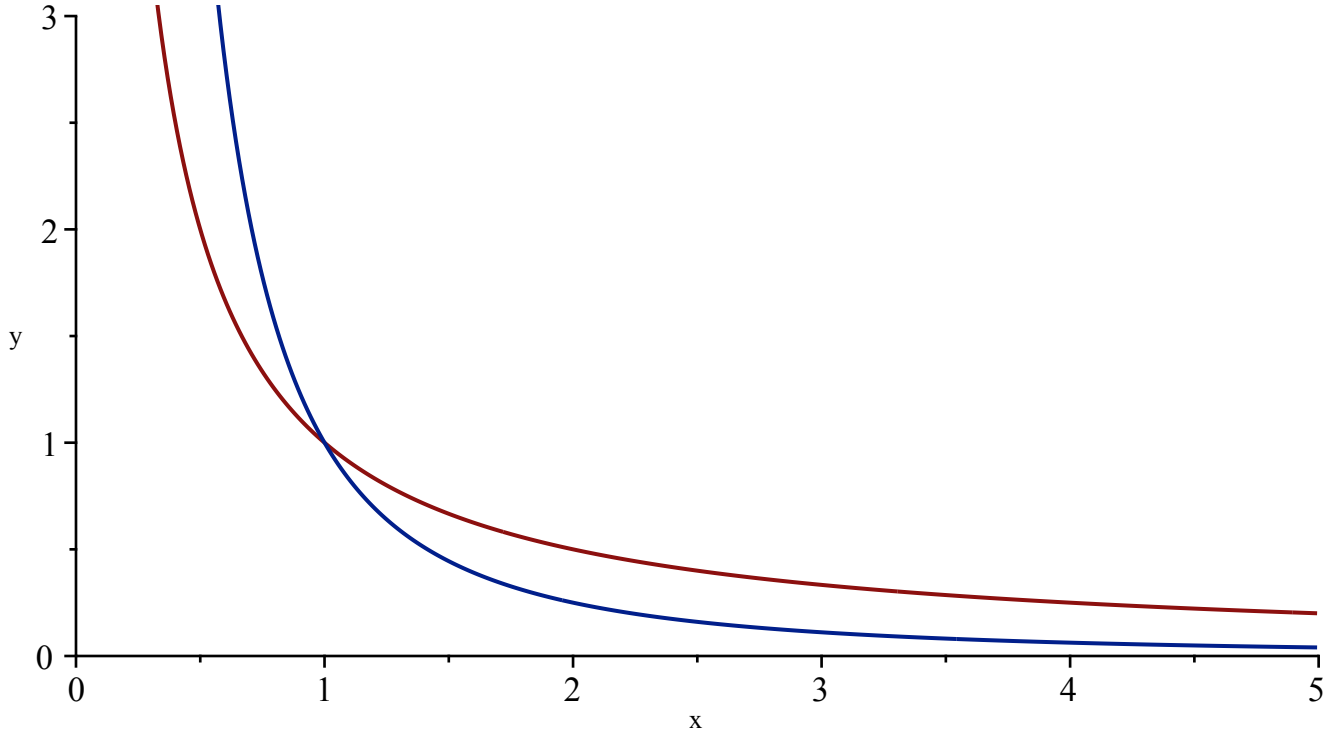
$$plot\left(\frac{1}{x}, x = 0..5, 0..3, labels = ["x", "y"]\right)$$



Plot 2 things on the same graph

To plot two curves on the same graph (assuming they depend on the same independent variable), we separate them by a comma and place them in square brackets like the following. In this example were plotting $y = \frac{1}{x}$ and $y = \frac{1}{x\hat{}2}$.

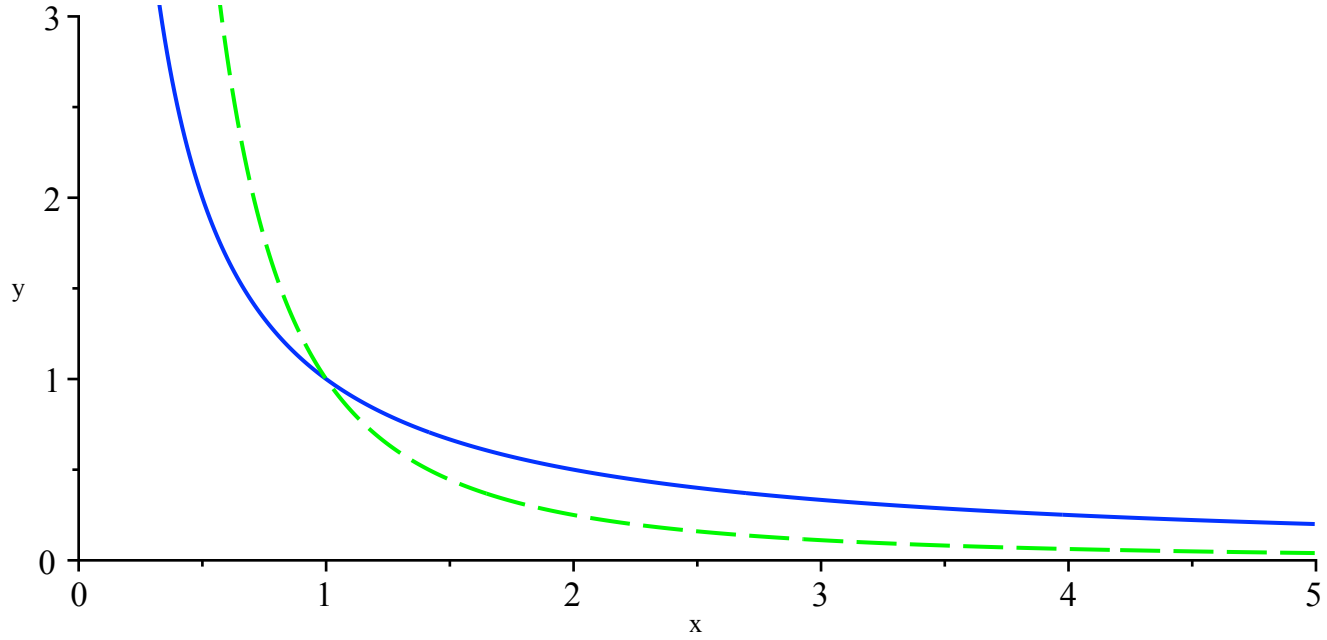
$$plot\left(\left[\frac{1}{x}, \frac{1}{x^2}\right], x = 0..5, 0..3, labels = ["x", "y"]\right)$$



Customize the appearance of each curve

We can customize any appearance property by placing the properties in square brackets (one for each curve), like this:

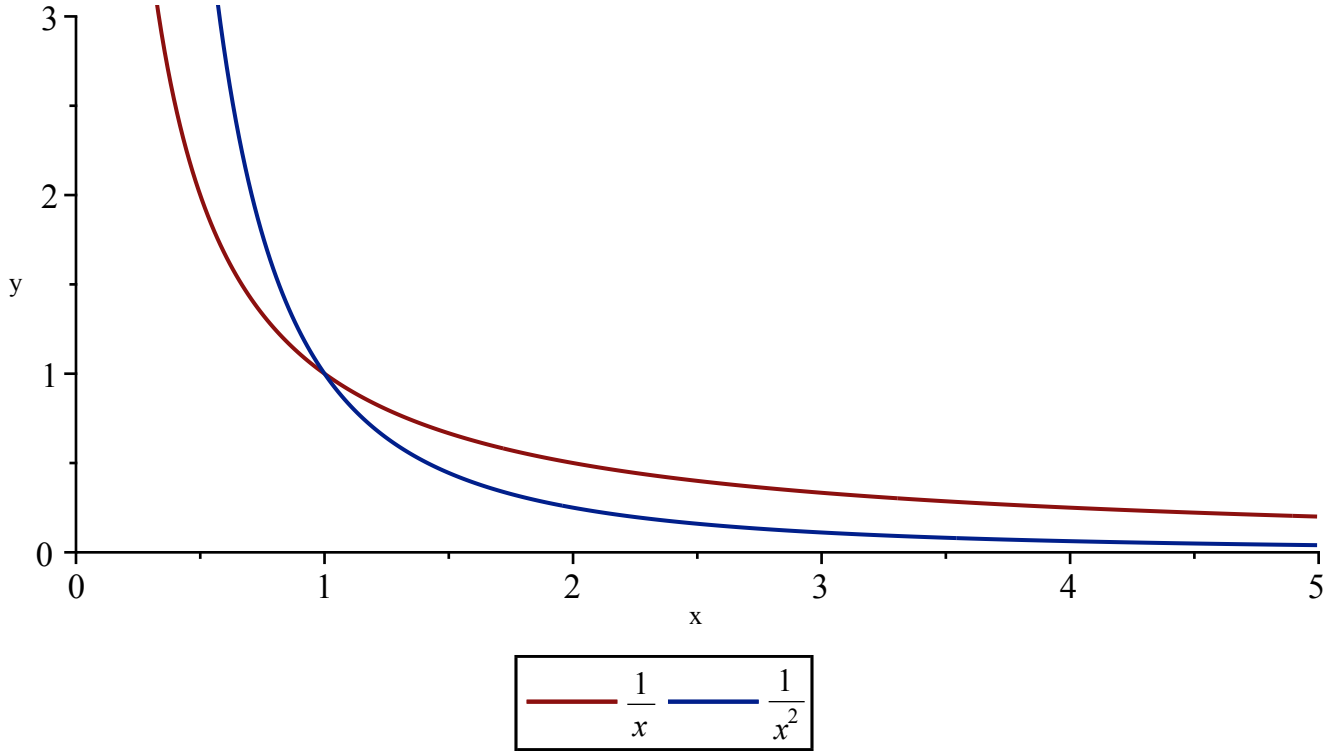
$$plot\left(\left[\frac{1}{x}, \frac{1}{x^2}\right], x = 0..5, 0..3, linestyle = [solid, dash], color = [blue, green], labels = ["x", "y"]\right)$$



Add legend

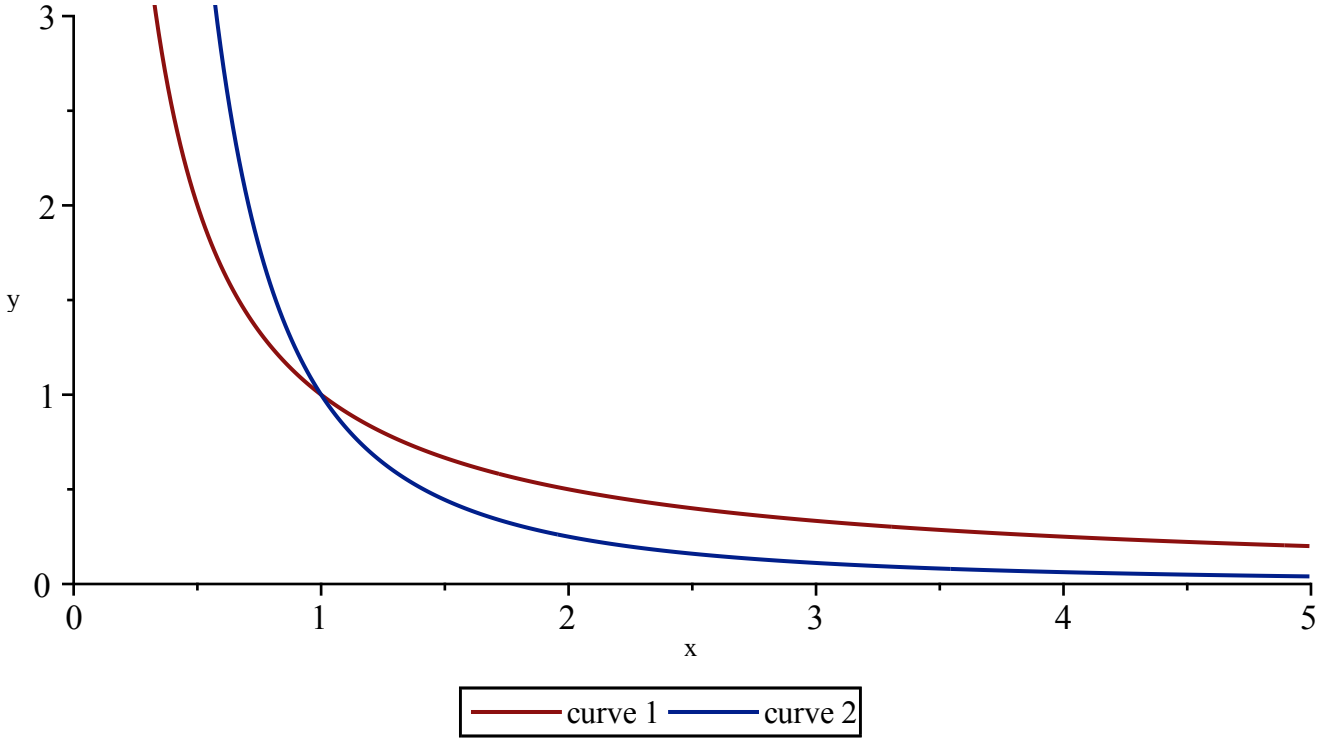
We use the legend option to add a legend. Notice that we have two legend expressions, one for each curve. Notice also, that we are labeling the curves using mathematical expressions (not in quotes) and that we place them in square brackets, separated by a comma.

$$plot\left(\left[\frac{1}{x}, \frac{1}{x^2}\right], x = 0..5, 0..3, labels = ["x", "y"], legend = \left[\frac{1}{x}, \frac{1}{x^2}\right]\right)$$



If we prefer to label the curves using text, we can put the text in quotes like this:

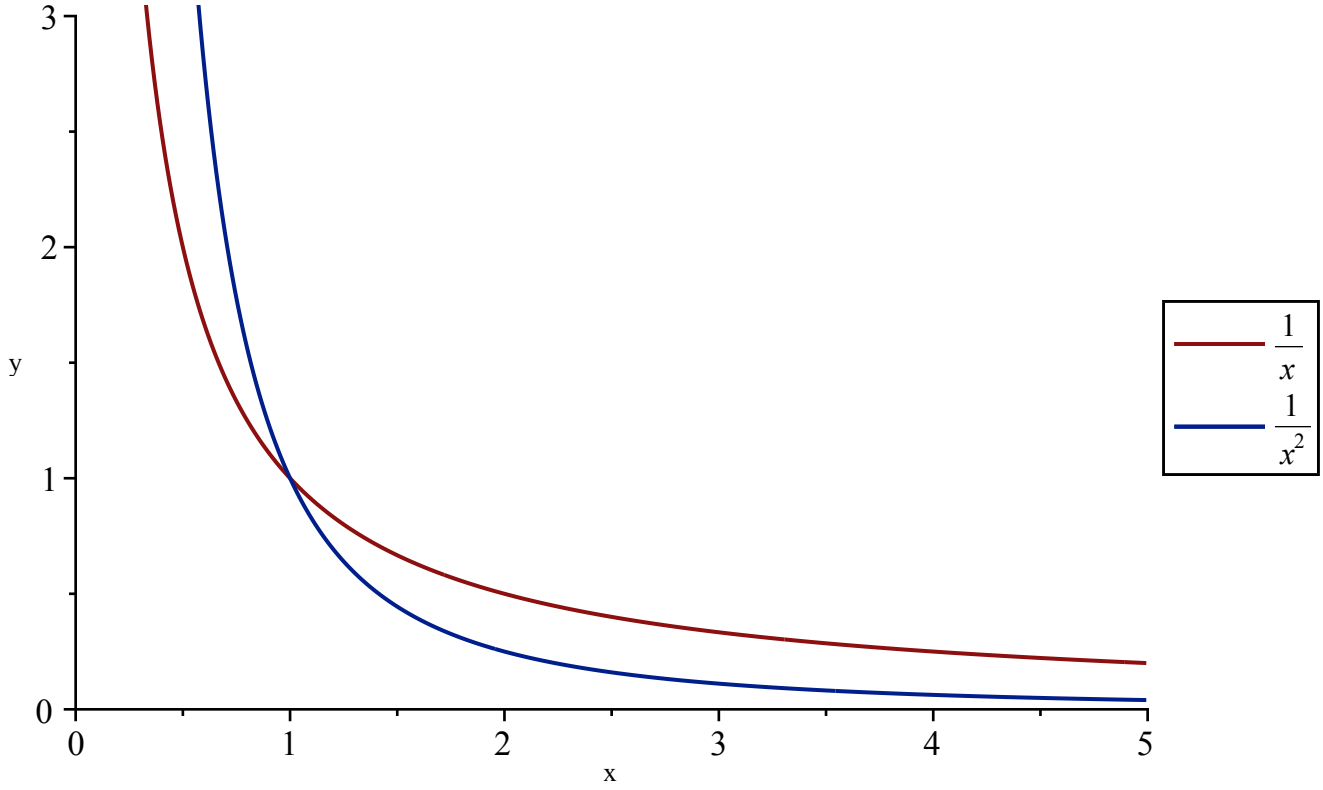
$$plot\left(\left[\frac{1}{x}, \frac{1}{x^2}\right], x = 0..5, 0..3, labels = ["x", "y"], legend = ["curve 1", "curve 2"]\right)$$



Reposition legend

You can reposition the legend by clicking on the plot, and then on the "Legend" suggestion on menu to the right side of the window. You can then click on "Position" and then "Right". Here's what it looks like:

$$plot\left(\left[\frac{1}{x}, \frac{1}{x^2}\right], x = 0..5, 0..3, labels = ["x", "y"], legend = \left[\frac{1}{x}, \frac{1}{x^2}\right]\right)$$



Parametric Plot with equal axis scaling

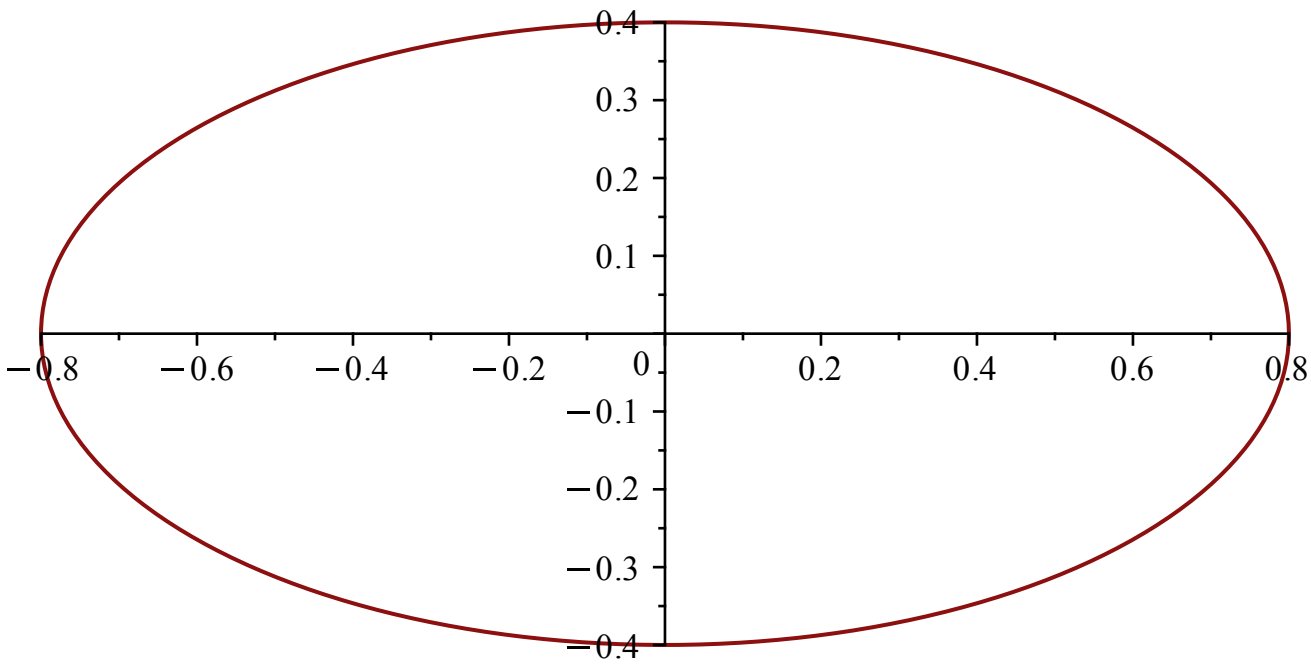
Plot the parametric set of equations over one period $0 < s < 2\,\pi$:

$x(s) = 0.8\cos(s)$

$y(s) = 0.4\cos(s)$

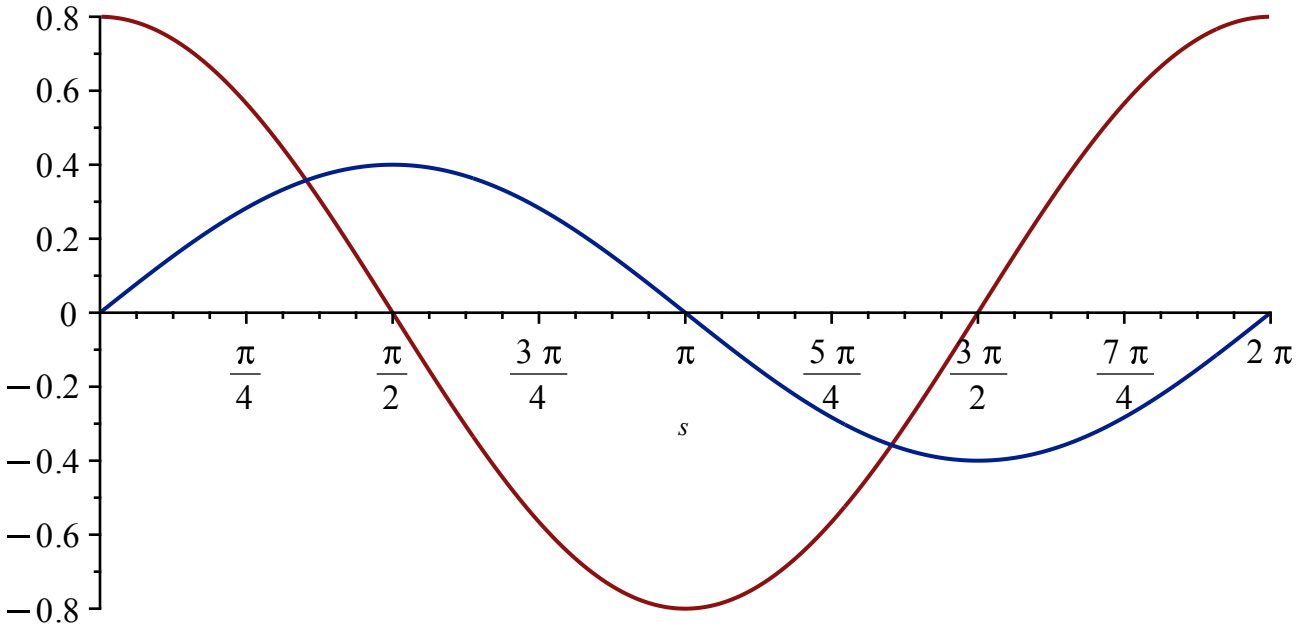
The parameter 'scaling = constrained' makes sure one unit on the x axis is the same length as one unit on the y axis. Notice that we place the $x(s)$ and $y(s)$ expressions along with the s plot range all within square brackets.

$plot([0.8\cdot\cos(s), 0.4\cdot\sin(s), s = 0..2\cdot\mathrm{Pi}], scaling = constrained)$



This example shows what happens when we just put the $x(s)$ and $y(s)$ expressions in the square bracket and leave the range $s = 0..2\,\mathrm{Pi}$ outside the bracket. We plot the two expressions as two different curves. Compare the difference between the following plot command and the previous one.

$$plot([0.8\cdot\cos(s), 0.4\cdot\sin(s)], s = 0..2\cdot\mathrm{Pi})$$

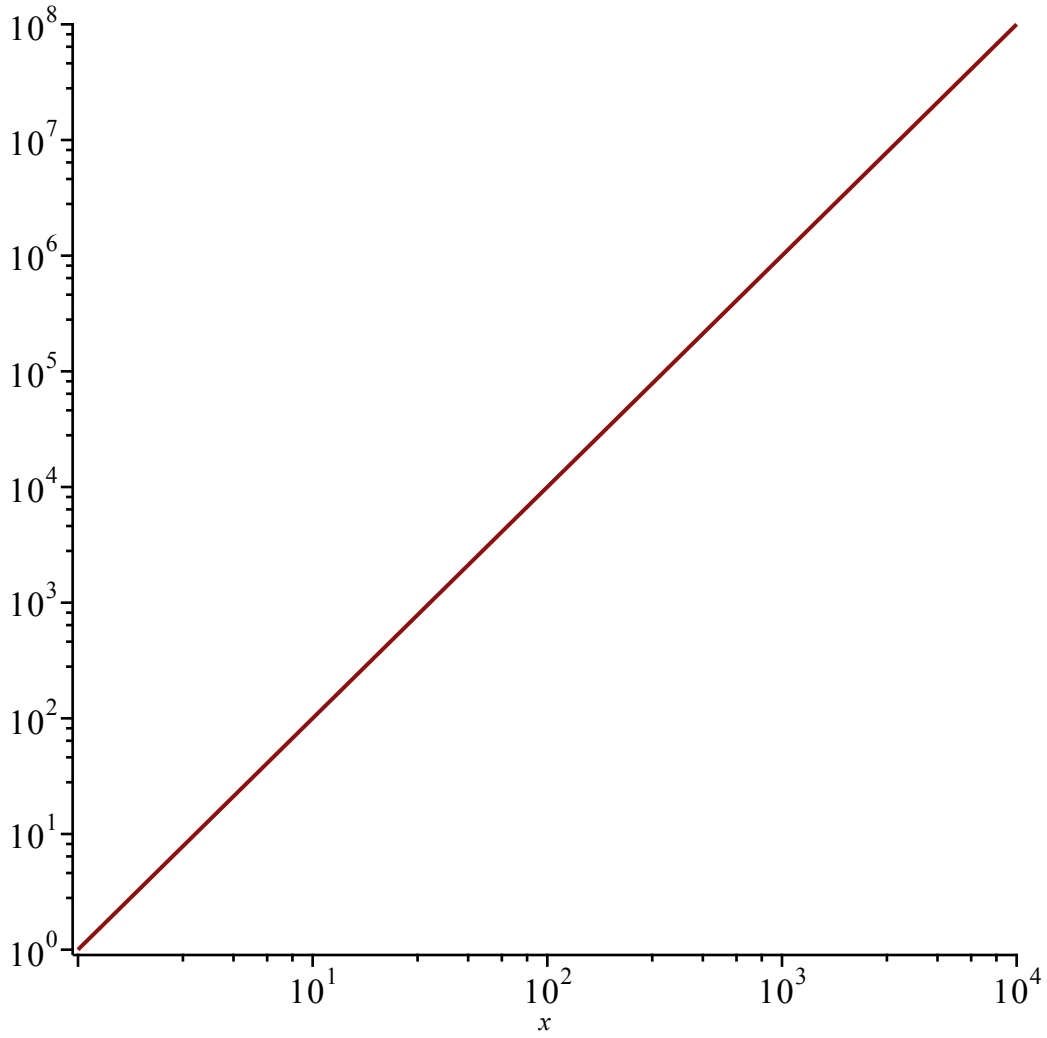


Log-log plot

Let's plot $y = x^2$ on a log-log plot over the range $1 < x < 10^4$. The command is loglogplot() and it works much the same way as the normal plot command. But in order to use it, we need to load in the plots package using the with() command like this:

$with(plots)$:

$loglogplot(x^2, x = 1..10^4)$



Notice that the graph of $y = x^2$ is a straight line on a log-log plot. This is true for any power law of the form $y = x^n$.

Polar plot

Let's plot $r = \theta^2$ on a polar plot over the range $1 < \theta < 6\,\pi$. The command is polarplot() and it also requires the plots package. The first argument in polarplot() is the radial variable r and the second is the range of the angular variable θ.

with(*plots*) :

polarplot$\left(\theta^2, \theta = 1..6\cdot\pi\right)$