

Lecture_1

1.1. Fundamentals of Plotting 2_Dimensional Analytic Algebraic Functions I

The *Mathematica* syntax for plotting a 2_dimensional analytic function such as $f(x)$ is `Plot[f(x), {x, x_min, x_max}]`. The plot command/function is `Plot`. Like any command in *Mathematica*, it is case sensitive—it begins with a capitalized letter followed by an open-closed bracket `[]`. The brackets contain two components, $f(x)$, and an open-closed braces, `{}`, these two components are separated with a comma. The open-closed braces, `{}`, are used to declare a *list*. For the `Plot` command the list contains three elements: the variable, the minimum and the maximum values of the variable. The elements of the list are separated by commas. It is a good habit to end the `Plot` command with a semicolon; this suppresses the additional prints of “Graphics” in a separate output cell.

Running *i.e.* depressing the combination of `shift+` of the `Plot` command syntax in the input mode produces a simple plot of $f(x)$. It plots the function along with ticked horizontal and vertical axes. The length of the horizontal and the height of the vertical axes are scaled. To make the appearance of the plotted function more appealing, the default aspect ratio is set to the inverse golden ratio

i.e. $\left(\frac{1+\sqrt{5}}{2}\right)^{-1} = 0.6$. The aspect ratio is the ratio of the scale of the vertical

axis to the one along the horizontal axis. **Figure 1** displays a circle of radius unity. It clearly shows the inequality of scales of the axes.

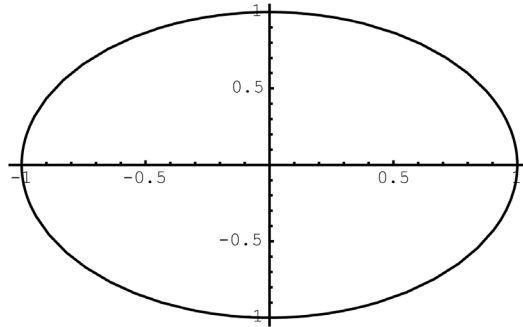
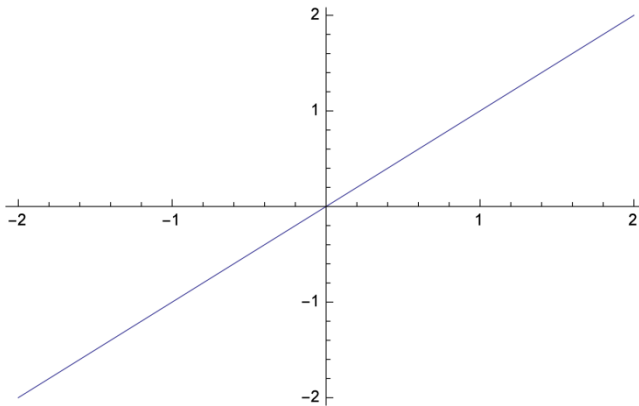


Figure 1

With this introduction consider a function, $f(x) = x$, and plot this within $-2 \leq x \leq 2$.

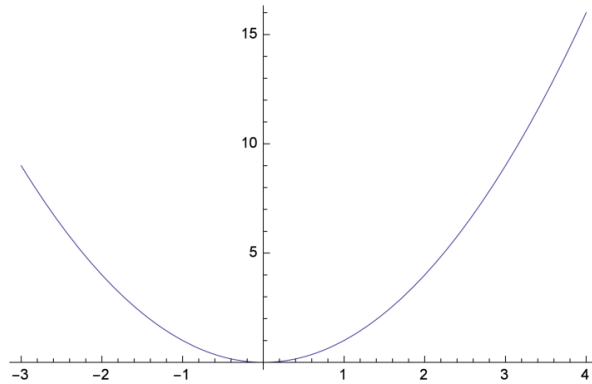
Following the plot command syntax enter

```
Plot[x, {x, -2, 2}]
```



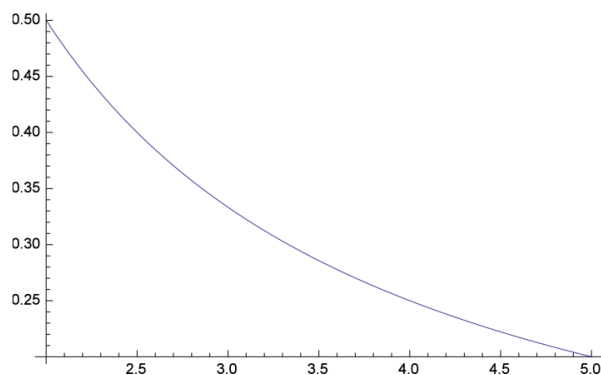
Here is another example. Plot $f(x) = x^2$ within $-3 \leq x \leq 4$. Note, to raise x to the power of 2, enter x and depress the combination **CTRL**+6. This moves the cursor to the superscript position and cursor changes into a placeholder. Enter 2 in the placeholder. To move the cursor from the superscript position to its original position, depress the combination **CTRL**+spacebar. The Plot command gives

Plot $[x^2, \{x, -3, 4\}]$



Example 3. Graph $f(x) = \frac{1}{x}$ within $2 \leq x \leq 5$. To make the fraction line, enter 1 then depress the combination **CTRL** +/. This moves the cursor into the denominator; now enter x . To move the cursor from the denominator to the front of the fraction line depress the combination **CTRL** +spacebar. The plot commands gives

Plot $[\frac{1}{x}, \{x, 2, 5\}]$



Repeat the last example for x within $-2 \leq x \leq 3$.