Graphing a function in *Mathematica*

(Barry McQuarrie, updated August 4, 2003)

Calculus at UMM is taught with the aid of *Mathematica*, however Precalculus does not use *Mathematica*.

In precalculus, a graphing calculator or some means of producing plots of functions will be useful, but not required for the course. Here I outline how you can create a plot of a function using *Mathematica*. If you use a graphing calculator, you will need to know the particular commands it uses to create plots of functions.

I do not expect nor desire to have you learn *Mathematica* in precalculus; I only offer this as an alternative to those of you who would like to learn how to plot a function in *Mathematica*. There is an associated *Mathematica* file you can download with all the commands I present here, plus a few further examples. If you have any questions, please come and talk to me.

The Plot Command

The command to plot a function f for x values between *xmin* and *xmax* is

`Plot[`f`, {`x`, `*xmin*`, `*xmax*` }]`

Capitalization and brackets are important in *Mathematica*, so you should notice that the P in Plot is capitalized and that some of the brackets are square and some curly.

The square brackets are used to delineate commands, so they are really part of the `Plot` command, `Plot[ ]`.

The curly brackets are used to denote lists, and {x, *xmin*, *xmax* } tells *Mathematica* which variable to plot with respect to, as well as what values to plot between.

A third type of bracket is used in *Mathematica*, the round bracket (...), and it is used to denote algebraic multiplication.

We can read the plot command `Plot[`f`, {`x`, `*xmin*`, `*xmax*` }]` as follows:

"Plot the function f with respect to x as x varies from *xmin* to *xmax*.", or

"Plot the function f as x varies from *xmin* to *xmax*."

Once you have typed the command in, you must use the <enter> key on the keypad to create the graph! The other <enter> key will simply take you to a new line to enter more input.

An Example

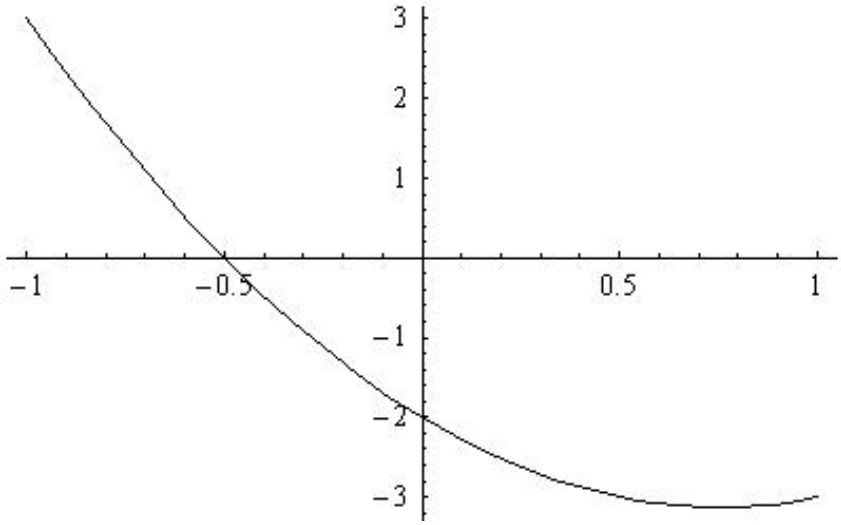
Example 1 page 45: Solve the equation $2x^2 - 3x - 2 = 0$ graphically.

The graphical solution will be found by finding where the function $y = 2x^2 - 3x - 2$ crosses the x axis. Here are the *Mathematica* commands we can use to plot the function:

`Plot[2*x^2 - 3*x - 2, {x, -1, 1}]` (remmeber to use the <enter> key on the keypad when you are done typing!)

(in English, "Plot the function $y = 2x^2 - 3x - 2$ as x varies from -1 to 1.")

The graph we get looks like the following:

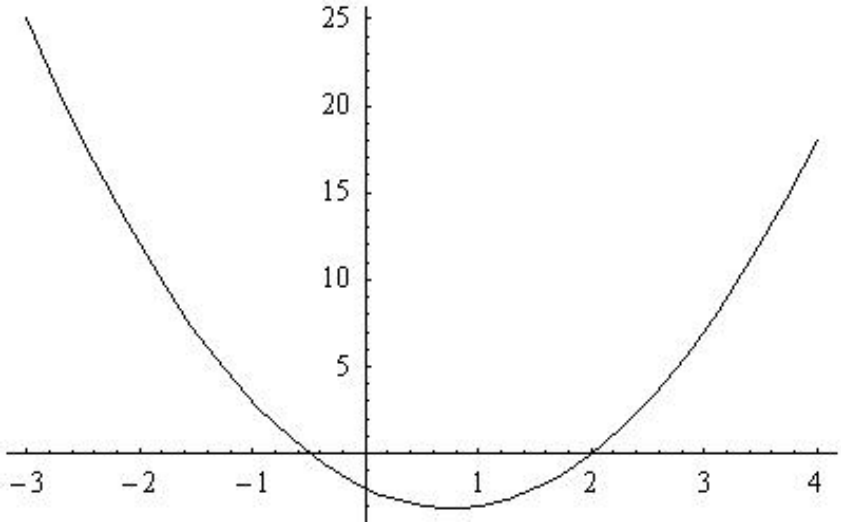


From this graph we see the function has a zero at $x = -0.5$. To find out if there are other zeros we should change the x values we are plotting the function at:

```
Plot[2*x^2 - 3*x - 2, {x, -3, 4}]
```

(in English, "Plot the function $y = 2x^2 - 3x - 2$ as x varies from -3 to 4.")

The graph we get looks like the following:



It looks, from our graphical analysis, that there are two solutions to the equation $2x^2 - 3x - 2 = 0$. They are $x = -0.5$ and $x = 2$.