

Graphing a function in *Mathematica*

(Barry McQuarrie, updated August 22, 2008)

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

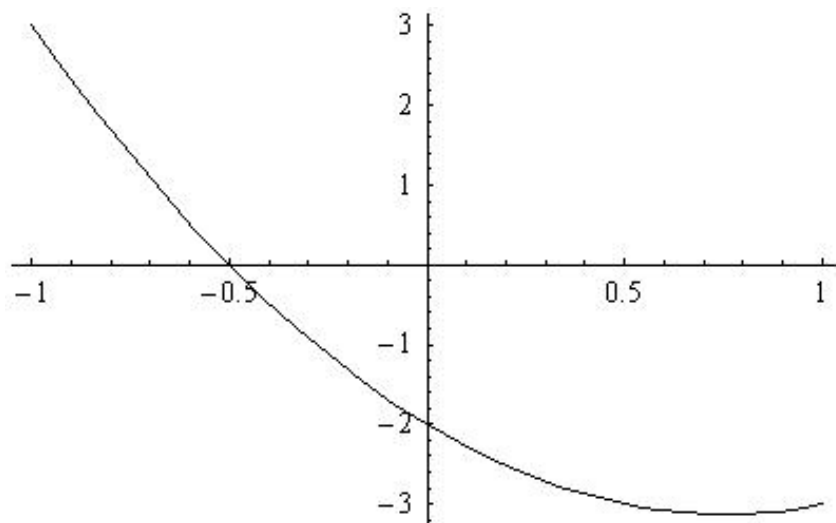
Example 1 page 45: Solve the equation $2x^2 - 3x - 2 = 0$ graphically.

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}] (remember 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:

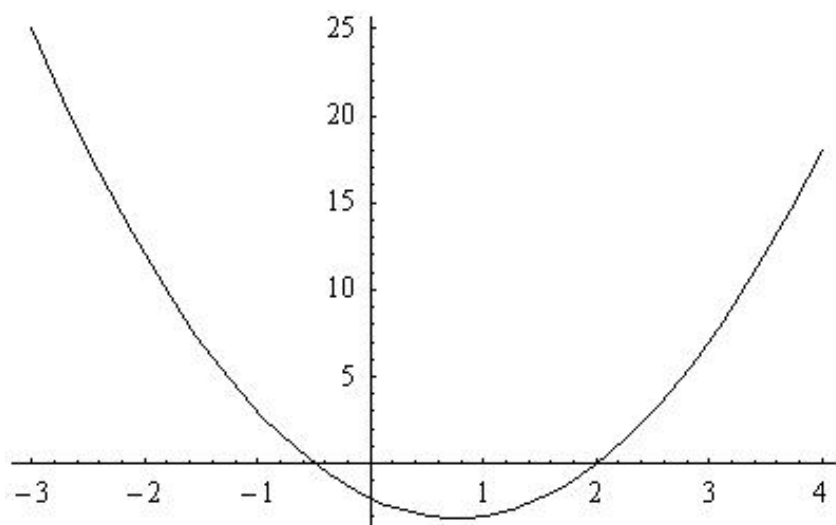


From this graph we see the function has a zero at $x = -0.5$. To find out if there are other zeros we should change the x values we are plotting the function at:

```
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 $x = 2$.