

Introduction to *Mathematica* for Algebra I

Most Important: 1. To execute (run) the computer code, press **Shift-Enter**.
2. It is **case-sensitive**. CAPITAL and *lower-case* matter.

Like a Calculator

Mathematica can do everything your calculator does and much, much more.

Type: **2*7+3(4-10)** and press **Shift-Enter**.

Type: **10+20/5** and press Shift-Enter.

Type: **(10+20)/5** and press Shift-Enter. What is the difference?

Type: **5^2** and press Shift-Enter.

Type: **6^3** and press Shift-Enter. What does ^ do?

Type: **Sqrt[81]** and press Shift-Enter. Be careful with CAPITAL letters.

Type: **152/12** and look at the form of your answer.

To get a decimal, type **N[152/12]** and execute.

Now try **N[152/12,50]** by going back and inserting the ,50

Also try **N[Pi,100]**.

Now make up and try calculations of your own.

Graphing a Line We will start by graphing $y = \frac{2}{5}x - 3$.

Type: **Plot[(2/5)x-3,{x,-15,15}]** and press Shift-Enter.

Let's make it look better.

Go back to the **Plot** command and insert **,PlotRange->{{-15,15},{-15,15}}**

Like this: **Plot[(2/5)x-3,{x,-15,15},PlotRange->{{-15,15},{-15,15}}]**

Add the following options after the **PlotRange** command inside the **]** (Don't forget commas!)

,PlotStyle->{RGBColor[1,0,0],Thickness[0.01]}

,AxesLabel->{x,y}

,GridLines->Automatic **Be careful with capitals.**

,AspectRatio->Automatic **Do one at a time to see what happens.**

Try changing the slope and the *y*-intercept of the line. Do the new graphs make sense?

Graphing a Parabola

Copy and paste the code for the line to the bottom of the *Mathematica* window.

To do this: Click on the first blue bracket on the right side of the **Plot** command.

Select “Copy” from the “Edit” menu.

Scroll to the bottom of the *Mathematica* window and click at the bottom.

Select “Paste” from the “Edit” menu.

Delete the equation of the line and type $x^2 - 5x - 6$ in its place. Press Shift-Enter.

What are the answers to $x^2 - 5x - 6 = 0$?

Type: **Factor**[$x^2 - 5x - 6$]

Type: **Solve**[$x^2 - 5x - 6 == 0$] make sure you use *two* equal signs.

More Graphing

Cubic Equation

Change the expression in the **Plot** command to $x^3 + x^2 - 6x$.

Using the graph, find the answers to $x^3 + x^2 - 6x = 0$.

Factor and solve by hand and check your answers using *Mathematica*.

Do the same for $\frac{2}{x-5} + \frac{4}{x+1} = 0$. Type the function as **2/(x-5)+4/(x+1)**

What happens when $x = 5$ or $x = -1$?

System of Equations: Let's graph the system:
$$y = \frac{1}{6}x + 4$$
$$y = -x - 3$$

Change the expression in the **Plot** command to **{(1/6)x+4, -x-3}** include the **{}**s.

Also change the **Thickness[0.01]** command to **RGBColor[0,0,1]** and execute.

What is the solution to this system of equations? Use the graph. Try changing the colors.

Check your solution with **Solve[{y==(1/6)x+4, y==-x-3}, {x,y}]**

Advanced Graphing

Let's try some three-dimensional graphs.

Go to the “File” menu and select “New.”

Type: **Plot3D**[$x^2 + y^2$, {**x**, -5, 5}, {**y**, -5, 5}] and press Shift-Enter.

Type: **<<RealTime3D`** and press Shift-Enter (Note the *backward apostrophe*!)

Go back to the **Plot3D** command and execute it again.

Now click and drag on the graph. Try moving it while pressing Ctrl on the keyboard.

Change the function to **y*cos[x]** or **Sin[x]Cos[y]** or **Sqrt[x^2+y^2]**