

Mathematica Introduction for Calculus

Reminders:

- Press **Shift-Enter** to evaluate each command.
- Mathematica is **case-sensitive**; upper and lower case letters matter.
- If you want to make changes or add options, you can edit previous input and re-evaluate it.
- To get the **arrow** character \rightarrow type a hyphen - followed by the greater than sign $>$.
- Do NOT type the input labels (for example, In[1]:=). Mathematica automatically includes those and numbers them in the order you evaluate your commands. Your numbers do not have to match the numbers listed below.
- Your cursor is the horizontal bar between cells.

Basic Operations

In[1]:= **5 (3 + 4)**

In[2]:= **Sqrt[49]**

In[3]:= **Sqrt[10!]**

In[4]:= **N[Pi, 1000]**

Note: "Log" is ln. For other bases you can use Log and specify the base.

In[5]:= **Log[E]**

In[6]:= **Log[10, 1000]**

In[7]:= **Sin[Pi / 3]**

In[8]:= **ArcTan[Sqrt[3]]**

Algebra

In[9]:= **Expand[(x + 3)(x - 4)]**

In[10]:= **Factor[6 x^3 + 23 x^2 - 33 x + 10]**

Note: For "Solve" you need to use a double-equal sign ==.

In[11]:= **Solve[x + 4 == 2 x - 3]**

In[12]:= **Solve[x - 3 y + 4 == 2 x + y / 3 - 3, y]**

In[13]:= **Solve[{2 x + 4 y == 3, 2 x - 5 y == 6}, {x, y}]**

In[14]:= **Solve[Log[2 x] == 2 Log[3 x], x]**

Functions

In[15]:= **f[x_] := x + 1**

In[16]:= **f[4]**

In[17]:= **g[x_] := x^x**

```
In[18]:= g[f[x]]
```

```
In[19]:= g[f[3]]
```

2D Graphing

```
In[20]:= Plot[x^2 - 3, {x, -4, 4}]
```

```
In[21]:= Plot[x^2 - 3, {x, -4, 4}, PlotRange -> {-4, 6}, PlotStyle -> Red, AspectRatio -> Automatic]
```

```
In[22]:= Plot[Cos[x], {x, 0, 2 Pi}]
```

```
In[23]:= Plot[{x, x^2, x^3}, {x, -1, 1}, AspectRatio -> Automatic]
```

```
In[24]:= ParametricPlot[{Cos[3 t], Sin[4 t]}, {t, 0, 2 Pi}]
```

```
In[25]:= data = RandomInteger[{0, 20}, {50, 2}]
```

```
In[26]:= ListPlot[data]
```

```
In[27]:= ListPlot[data, PlotStyle -> {Blue, PointSize[Large]}]
```

3D Graphing

You can rotate 3D output with click-and-drag. You can zoom in and out by holding the Ctrl key while dragging.

```
In[28]:= Plot3D[y * Cos[x], {x, 0, 2 Pi}, {y, -3, 3}, PlotStyle -> Red]
```

```
In[29]:= Plot3D[{2 - x^2/2 - y^2/2, x/3 - y/5 - 1}, {x, -3, 3}, {y, -3, 3},  
PlotStyle -> {Yellow, Blue}, BoxRatios -> Automatic]
```

```
In[30]:= ParametricPlot3D[{5 Cos[v] Sin[u], u * Cos[v], u * Sin[v]},  
{u, 0, 2 Pi}, {v, 0, 2 Pi}, BoxRatios -> Automatic]
```

```
In[31]:= ParametricPlot3D[{5 Cos[v] Sin[u], u * Cos[v], u * Sin[v]}, {u, 0, 2 Pi},  
{v, 0, 2 Pi}, BoxRatios -> Automatic, MeshShading -> {{Blue, Yellow}},  
Boxed -> False, Axes -> False, Lighting -> "Neutral"]
```

Manipulate

```
In[32]:= Manipulate[n, {n, 1, 10}]
```

```
In[33]:= Manipulate[Plot[Sin[b * x], {x, 0, 2 Pi}], {b, 1, 5}]
```

```
In[34]:= Manipulate[Plot[a * Sin[b * x], {x, 0, 2 Pi}, PlotRange -> 5], {a, 0, 5}, {b, 1, 5}]
```

```
In[35]:= Manipulate[ParametricPlot3D[{u * Cos[v], u * Sin[v], u},  
{u, -a, a}, {v, 0, b}, PlotRange -> 1, BoxRatios -> Automatic, PlotStyle -> clr],  
{a, 0.001, 1}, {b, 0.001, 2 Pi}, {clr, ColorSlider}]
```

Web Sites

www.wolfram.com

www.wolfram.com/language/elementary-introduction

demonstrations.wolfram.com