
Introduction to MATHEMATICA

Basic algebra

```
In[31]:= 123^40
In[32]:= Sqrt[123]
In[33]:= N[Sqrt[123]]
In[34]:= N[Sqrt[123], 25]
In[35]:= Sqrt[144]
In[36]:= (x - 1)^3 * (x + 1)^3 + 1
Simplify[%]
Expand[%]
Factor[%]
Solve[% == 0, x]
NSolve[(x - 1)^3 * (x + 1)^3 + 1 == 0, x]
```

Defining and Graphing functions

```
In[42]:= f[x_] = Sin[x] / x
In[43]:= f[-Pi/2]
f[Pi/4]
f[2 Pi]
f[0]
In[47]:= Plot[f[x], {x, -1, 1}]
In[48]:= Plot[f[x], {x, -10, 10}]
In[49]:= Plot[f[x], {x, -50, 50}, PlotRange -> {- .5, 1.5}]
In[50]:= ? Limit
In[51]:= Limit[f[x], x -> Infinity]
In[52]:= Plot[f[x], {x, -50, 50}, PlotRange -> {- .5, 1.5}, Frame -> True, Background -> LightGreen]
```

Calculating derivatives

```
In[53]:= f'[x]
In[54]:= Plot[{f[x], f'[x]}, {x, -50, 50},
  PlotRange -> {- .5, 1.5}, Frame -> True, Background -> LightGreen]
In[55]:= Plot[{f[x], f'[x]}, {x, -8, 8}, PlotRange -> {- .5, 1.5},
  Frame -> True, Background -> LightGreen, PlotLabels -> "Expressions"]
In[56]:= f''[x]
```

```
In[57]:= D[f[x], {x, 10}]
```

```
In[58]:= g[x_] = Sec[x]
          g'[x]
          g''[x]
```

```
In[61]:= Table[D[g[x], {x, k}], {k, 0, 7}]
```

```
In[62]:= TableForm[%]
```

```
In[63]:= Plot[ArcSin[Sin[x]], {x, -4 Pi, 4 Pi}]
```

```
In[64]:= Plot[ArcSin[Sin[x]], {x, -4 Pi, 4 Pi}, AspectRatio -> 3 / (8 Pi)]
```

From Problem Set 3

```
In[65]:= a = -1;
          Plot[{E^x, Log[x], E^a * x + E^a * (1 - a)},
              {x, -4, 4}, PlotRange -> {-10, 10}, Background -> LightGreen]
```

```
In[67]:= a
```

```
In[68]:= Clear[a]
```

```
In[69]:= a
```

```
In[70]:= Animate[
          Plot[{E^x, Log[x], E^a * x + E^a * (1 - a)},
              {x, -4, 4}, PlotRange -> {-10, 10}, Background -> LightGreen]
          , {a, -5, 2, .01}]
```