

A Little Calculus with Mathematica

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 >.
 - Your cursor is the horizontal bar between cells.
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Limits

```
In[1]:= Limit[(x - 3) / (x^2 - 9), x -> 4]
In[2]:= Limit[(x - 3) / (x^2 - 9), x -> 3]
In[3]:= Limit[(4 x^3 - 5) / (6 x^3 + 2 x^2 - 8), x -> Infinity]
In[4]:= HoldForm[Limit[(4 x^3 - 5) / (6 x^3 + 2 x^2 - 8), x -> Infinity]]
In[10]:= Limit[1/x, x -> 0]
In[11]:= Limit[E^x, x -> Infinity]
```

Derivatives

```
In[12]:= D[3 x^4 + 2 x + 4, x]
In[14]:= TraditionalForm[D[3 x^4 + 2 x + 4, x]]
In[13]:= HoldForm[D[3 x^4 + 2 x + 4, x]]
In[33]:= f[x_] := x^3 Cos[x^2]
In[34]:= f[3]
In[41]:= Plot[f[x], {x, -2 Pi, 2 Pi}]
In[20]:= D[f[x], x]
In[35]:= D[f[x], x] /. x -> 3
In[36]:= D[f[x], x] /. x -> 3 // N
In[42]:= Plot[Evaluate[D[f[x], x]], {x, -2 Pi, 2 Pi}]
In[39]:= Plot[{f[x], Evaluate[D[f[x], x]]}, {x, Pi/2, 5 Pi/4}, PlotRange -> All]
```

```
In[38]:= Plot[{f[x], Evaluate[D[f[x], x]]},
  {x, Pi/2, 5 Pi/4}, PlotRange -> All, PlotStyle -> {Blue, Red}]
```

```
In[48]:= g[x_] := x^3 + 2 x^2 - 8 x
```

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In[49]:= D[g[x], x]
```

```
In[50]:= D[D[g[x], x], x]
```

```
In[51]:= D[g[x], {x, 2}]
```

```
In[52]:= D[g[x], {x, 3}]
```

Try this one below and hover your mouse over each curve if you use Tooltip.

```
In[54]:= Plot[Tooltip@g[x], Evaluate@D[g[x], x], Evaluate@D[g[x], {x, 2}]], {x, -5, 5}]
```

Integrals

```
In[57]:= Integrate[x^3 + 2 x^2 - 8 x, x]
```

```
In[61]:= Integrate[x^3 + 2 x^2 - 8 x, {x, -4, 0}]
```

```
In[62]:= NIntegrate[x^3 + 2 x^2 - 8 x, {x, -4, 0}]
```

```
In[63]:= HoldForm[Integrate[x^3 + 2 x^2 - 8 x, {x, -4, 0}]]
```

```
In[58]:= Plot[x^3 + 2 x^2 - 8 x, {x, -5, 5}]
```

```
In[59]:= Plot[x^3 + 2 x^2 - 8 x, {x, -5, 5}, Filling -> Axis]
```

```
In[60]:= Show[
  Plot[x^3 + 2 x^2 - 8 x, {x, -5, 5}],
  Plot[x^3 + 2 x^2 - 8 x, {x, -4, 0}, Filling -> Axis]
]
```

```
In[64]:= Row[{HoldForm[Integrate[x^3 + 2 x^2 - 8 x, {x, -4, 0}]],
  " = ", Integrate[x^3 + 2 x^2 - 8 x, {x, -4, 0}]]]
```