

# **Bill Knowlton MSE 310**

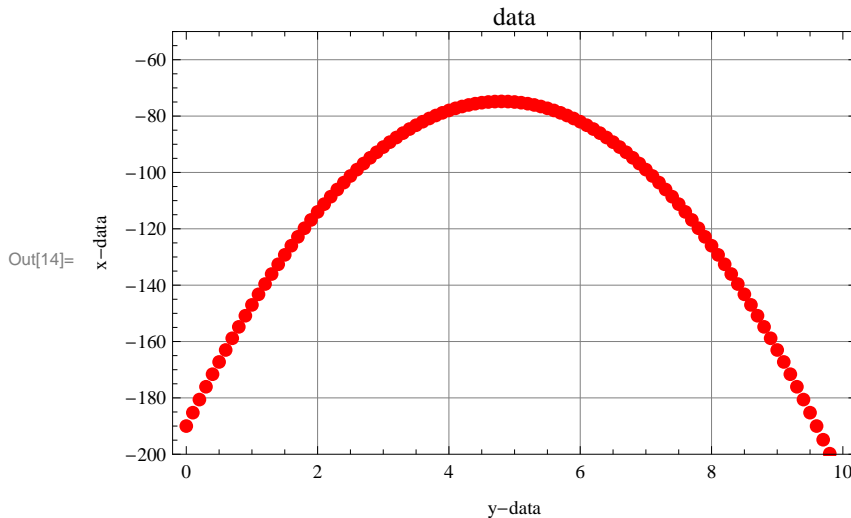
Materials Science and Engineering  
Boise State University

- **The example below shows how one can extract the maximum peak height from a data set**

```

In[12]:= Clear[data]
(*data set is below*)
data = {{0.`, -190.`, {0.1`, -185.25`}, {0.2`, -180.6`},
  {0.30000000000000004`, -176.05`}, {0.4`, -171.6`}, {0.5`, -167.25`},
  {0.6000000000000001`, -163.`, {0.7000000000000001`, -158.85`},
  {0.8`, -154.8`}, {0.9`, -150.85`}, {1.`, -147.`,
  {1.1`, -143.2500000000003`}, {1.2000000000000002`, -139.6`},
  {1.3`, -136.05`}, {1.4000000000000001`, -132.5999999999997`},
  {1.5`, -129.25`}, {1.6`, -126.0000000000001`},
  {1.7000000000000002`, -122.85`}, {1.8`, -119.8000000000001`},
  {1.9000000000000001`, -116.85`}, {2.`, -114.`, {2.1`, -111.25`},
  {2.2`, -108.6000000000001`}, {2.3000000000000003`, -106.0499999999998`},
  {2.4000000000000004`, -103.6`}, {2.5`, -101.25`}, {2.6`, -99.`,
  {2.7`, -96.85`}, {2.8000000000000003`, -94.7999999999998`},
  {2.9000000000000004`, -92.85`}, {3.`, -91.`, {3.1`, -89.25`},
  {3.2`, -87.6`}, {3.3000000000000003`, -86.0499999999998`},
  {3.4000000000000004`, -84.6`}, {3.5`, -83.25`}, {3.6`, -82.`, {3.7`, -80.85`},
  {3.8000000000000003`, -79.8`}, {3.9000000000000004`, -78.85`}, {4.`, -78.`,
  {4.1000000000000005`, -77.25`}, {4.2`, -76.6`}, {4.3`, -76.05`},
  {4.4`, -75.6`}, {4.5`, -75.25`}, {4.6000000000000005`, -75.`,
  {4.7`, -74.8500000000001`}, {4.800000000000001`, -74.8`},
  {4.9`, -74.85`}, {5.`, -75.`, {5.1000000000000005`, -75.25`},
  {5.2`, -75.6000000000001`}, {5.300000000000001`, -76.05`},
  {5.4`, -76.6000000000001`}, {5.5`, -77.25`}, {5.6000000000000005`, -78.`,
  {5.7`, -78.8500000000001`}, {5.800000000000001`, -79.8000000000001`},
  {5.9`, -80.8500000000001`}, {6.`, -82.`, {6.1000000000000005`, -83.25`},
  {6.2`, -84.6000000000001`}, {6.300000000000001`, -86.0500000000001`},
  {6.4`, -87.6000000000001`}, {6.5`, -89.25`}, {6.6000000000000005`, -91.`,
  {6.7`, -92.8500000000001`}, {6.800000000000001`, -94.8000000000001`},
  {6.9`, -96.8500000000001`}, {7.`, -99.`,
  {7.1000000000000005`, -101.2500000000001`}, {7.2`, -103.6000000000001`},
  {7.300000000000001`, -106.0500000000001`}, {7.4`, -108.6000000000002`},
  {7.5`, -111.25`}, {7.6000000000000005`, -114.0000000000001`},
  {7.7`, -116.8500000000001`}, {7.800000000000001`, -119.8000000000003`},
  {7.9`, -122.8500000000002`}, {8.`, -126.`, {8.1`, -129.2499999999997`},
  {8.200000000000001`, -132.6000000000002`}, {8.3`, -136.05`},
  {8.4`, -139.6000000000002`}, {8.5`, -143.25`}, {8.6`, -146.9999999999997`},
  {8.700000000000001`, -150.8500000000002`}, {8.8`, -154.8000000000004`},
  {8.9`, -158.8500000000002`}, {9.`, -163.`, {9.1`, -167.2499999999997`},
  {9.200000000000001`, -171.6000000000005`}, {9.3`, -176.05`},
  {9.4`, -180.6000000000002`}, {9.5`, -185.25`}, {9.600000000000001`,
  -190.0000000000006`}, {9.700000000000001`, -194.8500000000005`},
  {9.8`, -199.8`}, {9.9`, -204.8500000000002`}, {10.`, -210.}}};
(*Plotting the data*)
ListPlot[data, Frame → True, GridLines → Automatic,
  PlotStyle → {RGBColor[1, 0, 0], PointSize[0.02`]}, PlotLabel → "data",
  FrameLabel → {"y-data", "x-data"}, Frame → True, PlotRange → {-200, -50}]

```



## Finding and extracting the peak maximum for the y-data

```
In[15]:= Clear[ydata, maxdatapoint, maxydata, position, pos, position, maxxdata]
ydata = Part[data, All, {2}];
(*extracting the y data and placing it in a list so that
  Max[] can be used to extract out the maximum y-data point*)
Max[ydata] (*finding the maximum y data point from the y-data list*)
pos = Position[data, Max[ydata]]
(*finding the position of the maximum y data point from the data*)
position = Extract[Flatten[pos], {1}]
(*extracts the position of the max y-data point from the y-data list *)
(*Flatten[ ] flattens the nexted list {{}} into a typical list {}
  and extracts the first number in the list which is the position*)
maxdatapoint = Part[data, position, {1, 2}]
(*provides the data point that includes max y-data and its x-pair*)
maxydata = First[Part[data, position, {2}]]
(* extracting the maximum number from table*)
maxxdata = First[Part[data, position, {1}]]
Print["Max y-value is: ", maxydata]
Print["x-value at max y-value is: ", maxxdata]
Print["Max data point is: ", maxdatapoint]
```

Out[17]= -74.8

Out[18]= {{49, 2}}

Out[19]= 49

Out[20]= {4.8, -74.8}

Out[21]= -74.8

Out[22]= 4.8

Max y-value is: -74.8

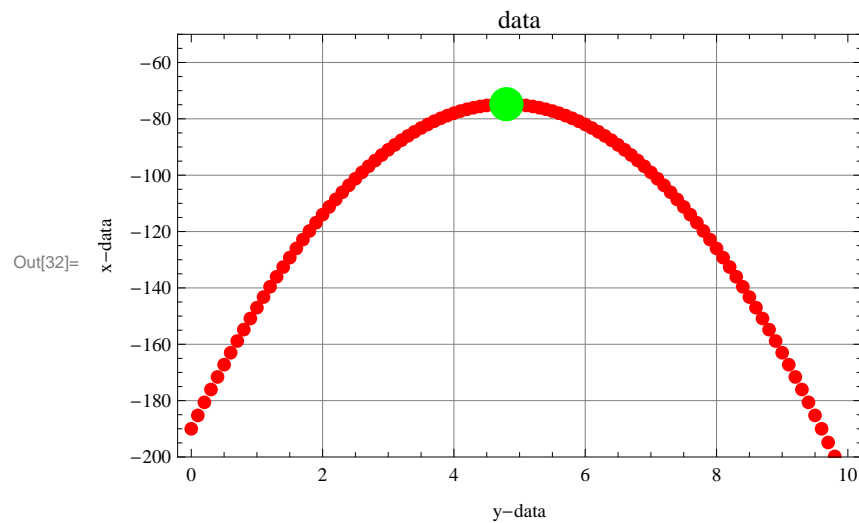
x-value at max y-value is: 4.8

Max data point is: {4.8, -74.8}

## That's it!

- **Plotting the data which shows the peak and the peak maximum data point.**  
Thanks to Caleb, this part works!

```
In[32]:= ListPlot[data, Frame → True, GridLines → Automatic, PlotStyle →
  {{RGBColor[1, 0, 0], PointSize[0.02`]}, {RGBColor[0, 1, 0], PointSize[0.05]}},
  PlotLabel → "data", FrameLabel → {"y-data", "x-data"},
  Frame → True, PlotRange → {-200, -50},
  Epilog → {RGBColor[0, 1, 0], PointSize[0.05], Point[{maxxdata, maxydata}]}]
```



■ **Creating data that contain peaks. Not important for this exercise.**

```
data = Table[{x, function[x]}, {x, 0, 10, .1}]
{{0., -190.}, {0.1, -185.25}, {0.2, -180.6}, {0.3, -176.05}, {0.4, -171.6},
{0.5, -167.25}, {0.6, -163.}, {0.7, -158.85}, {0.8, -154.8}, {0.9, -150.85},
{1., -147.}, {1.1, -143.25}, {1.2, -139.6}, {1.3, -136.05}, {1.4, -132.6},
{1.5, -129.25}, {1.6, -126.}, {1.7, -122.85}, {1.8, -119.8}, {1.9, -116.85},
{2., -114.}, {2.1, -111.25}, {2.2, -108.6}, {2.3, -106.05}, {2.4, -103.6},
{2.5, -101.25}, {2.6, -99.}, {2.7, -96.85}, {2.8, -94.8}, {2.9, -92.85},
{3., -91.}, {3.1, -89.25}, {3.2, -87.6}, {3.3, -86.05}, {3.4, -84.6},
{3.5, -83.25}, {3.6, -82.}, {3.7, -80.85}, {3.8, -79.8}, {3.9, -78.85},
{4., -78.}, {4.1, -77.25}, {4.2, -76.6}, {4.3, -76.05}, {4.4, -75.6},
{4.5, -75.25}, {4.6, -75.}, {4.7, -74.85}, {4.8, -74.8}, {4.9, -74.85},
{5., -75.}, {5.1, -75.25}, {5.2, -75.6}, {5.3, -76.05}, {5.4, -76.6},
{5.5, -77.25}, {5.6, -78.}, {5.7, -78.85}, {5.8, -79.8}, {5.9, -80.85},
{6., -82.}, {6.1, -83.25}, {6.2, -84.6}, {6.3, -86.05}, {6.4, -87.6},
{6.5, -89.25}, {6.6, -91.}, {6.7, -92.85}, {6.8, -94.8}, {6.9, -96.85}, {7., -99.},
{7.1, -101.25}, {7.2, -103.6}, {7.3, -106.05}, {7.4, -108.6}, {7.5, -111.25},
{7.6, -114.}, {7.7, -116.85}, {7.8, -119.8}, {7.9, -122.85}, {8., -126.},
{8.1, -129.25}, {8.2, -132.6}, {8.3, -136.05}, {8.4, -139.6}, {8.5, -143.25},
{8.6, -147.}, {8.7, -150.85}, {8.8, -154.8}, {8.9, -158.85}, {9., -163.},
{9.1, -167.25}, {9.2, -171.6}, {9.3, -176.05}, {9.4, -180.6}, {9.5, -185.25},
{9.6, -190.}, {9.7, -194.85}, {9.8, -199.8}, {9.9, -204.85}, {10., -210.}}
```

```
Clear[gaus, x, gausdata]
```

```
gaus[x_] = 10 Exp[- $\frac{(x-5)^2}{1}$ ] - 20
```

```
gausdata = Table[{x, gaus[x]}, {x, 0, 10, .1}]
```

```
ListPlot[gausdata, Frame → True, GridLines → Automatic, PlotStyle →
  {{RGBColor[1, 0, 0], PointSize[0.02]}, {RGBColor[0, 1, 0], PointSize[0.05]}},
  PlotLabel → "data", FrameLabel → {"y-data", "x-data"},
  Frame → True, PlotRange → {-22, 0}]
```

```
-20 + 10 e-(5+x)2
```

```
{ {0., -20.}, {0.1, -20.}, {0.2, -20.}, {0.3, -20.}, {0.4, -20.}, {0.5, -20.},
  {0.6, -20.}, {0.7, -20.}, {0.8, -20.}, {0.9, -20.}, {1., -20.}, {1.1, -20.},
  {1.2, -20.}, {1.3, -20.}, {1.4, -20.}, {1.5, -20.}, {1.6, -19.9999},
  {1.7, -19.9998}, {1.8, -19.9996}, {1.9, -19.9993}, {2., -19.9988}, {2.1, -19.9978},
  {2.2, -19.9961}, {2.3, -19.9932}, {2.4, -19.9884}, {2.5, -19.9807},
  {2.6, -19.9685}, {2.7, -19.9496}, {2.8, -19.9209}, {2.9, -19.8784},
  {3., -19.8168}, {3.1, -19.7295}, {3.2, -19.6084}, {3.3, -19.4442}, {3.4, -19.227},
  {3.5, -18.946}, {3.6, -18.5914}, {3.7, -18.1548}, {3.8, -17.6307}, {3.9, -17.018},
  {4., -16.3212}, {4.1, -15.5514}, {4.2, -14.7271}, {4.3, -13.8737},
  {4.4, -13.0232}, {4.5, -12.212}, {4.6, -11.4786}, {4.7, -10.8607},
  {4.8, -10.3921}, {4.9, -10.0995}, {5., -10.}, {5.1, -10.0995}, {5.2, -10.3921},
  {5.3, -10.8607}, {5.4, -11.4786}, {5.5, -12.212}, {5.6, -13.0232}, {5.7, -13.8737},
  {5.8, -14.7271}, {5.9, -15.5514}, {6., -16.3212}, {6.1, -17.018}, {6.2, -17.6307},
  {6.3, -18.1548}, {6.4, -18.5914}, {6.5, -18.946}, {6.6, -19.227}, {6.7, -19.4442},
  {6.8, -19.6084}, {6.9, -19.7295}, {7., -19.8168}, {7.1, -19.8784},
  {7.2, -19.9209}, {7.3, -19.9496}, {7.4, -19.9685}, {7.5, -19.9807},
  {7.6, -19.9884}, {7.7, -19.9932}, {7.8, -19.9961}, {7.9, -19.9978},
  {8., -19.9988}, {8.1, -19.9993}, {8.2, -19.9996}, {8.3, -19.9998},
  {8.4, -19.9999}, {8.5, -20.}, {8.6, -20.}, {8.7, -20.}, {8.8, -20.},
  {8.9, -20.}, {9., -20.}, {9.1, -20.}, {9.2, -20.}, {9.3, -20.}, {9.4, -20.},
  {9.5, -20.}, {9.6, -20.}, {9.7, -20.}, {9.8, -20.}, {9.9, -20.}, {10., -20.}}
```

