Ph3 Set 4

Jacob Snyder

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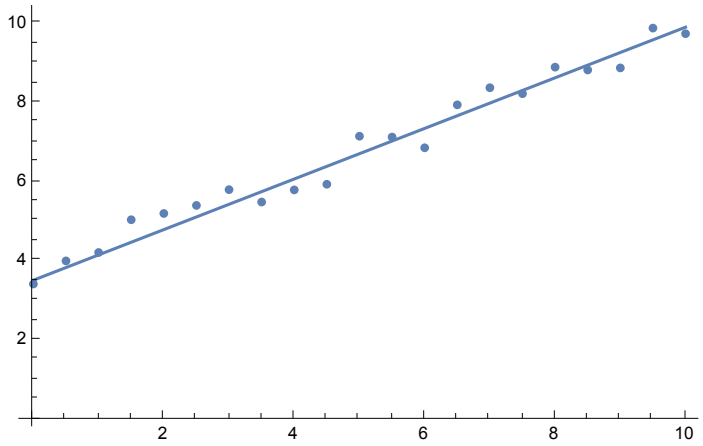
```
data = Rest@Import["http://pmaweb.caltech.edu/~phy003/labs/Data1.txt", "TSV"]
```

```
{{0., 3.4039}, {0.5, 3.9881}, {1., 4.2004}, {1.5, 5.0291}, {2., 5.188}, {2.5, 5.3914},
 {3., 5.7904}, {3.5, 5.4771}, {4., 5.784}, {4.5, 5.9271}, {5., 7.1422},
 {5.5, 7.1213}, {6., 6.8499}, {6.5, 7.936}, {7., 8.3686}, {7.5, 8.2178},
 {8., 8.8891}, {8.5, 8.8176}, {9., 8.8702}, {9.5, 9.8769}, {10., 9.7354}}
```

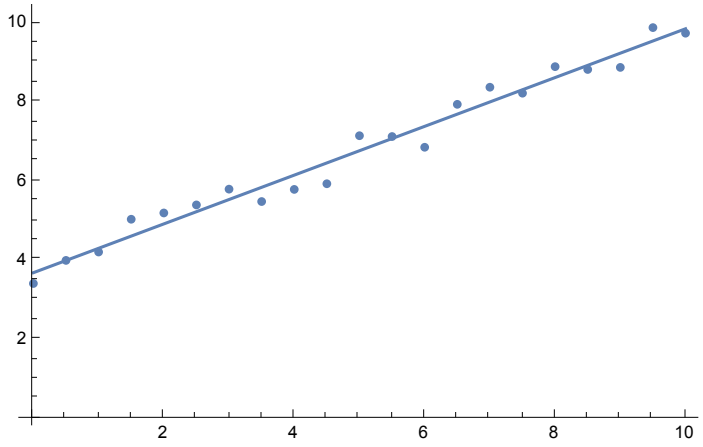
```
Show[ListPlot[data], Plot[0.64 x + 3.5, {x, 0, 10}]]
```




```
lsq = Fit[data, {1, x}, x]
```

```
3.6771 + 0.617003 x
```

```
Show[ListPlot[data], Plot[lsq, {x, 0, 10}]]
```



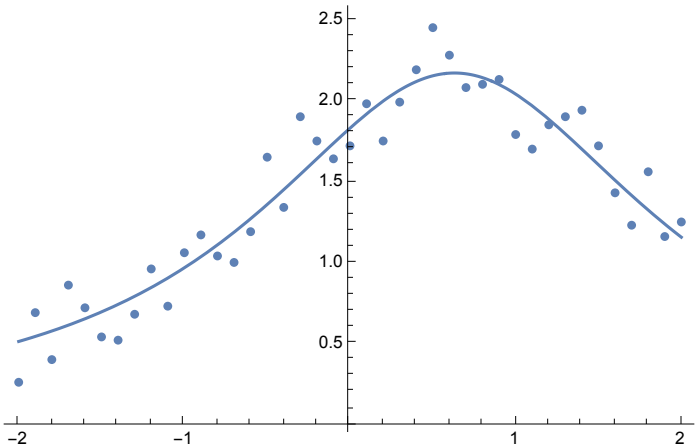

```
data = Import["http://pmaweb.caltech.edu/~phy003/labs/LorentzianData.txt", "TSV"]
```

```
{{-2., 0.26}, {-1.9, 0.69}, {-1.8, 0.4}, {-1.7, 0.86}, {-1.6, 0.72}, {-1.5, 0.54},
 {-1.4, 0.52}, {-1.3, 0.68}, {-1.2, 0.96}, {-1.1, 0.73}, {-1., 1.06},
 {-0.9, 1.17}, {-0.8, 1.04}, {-0.7, 1.}, {-0.6, 1.19}, {-0.5, 1.65}, {-0.4, 1.34},
 {-0.3, 1.9}, {-0.2, 1.75}, {-0.1, 1.64}, {0., 1.72}, {0.1, 1.98}, {0.2, 1.75},
 {0.3, 1.99}, {0.4, 2.19}, {0.5, 2.45}, {0.6, 2.28}, {0.7, 2.08}, {0.8, 2.1},
 {0.9, 2.13}, {1., 1.79}, {1.1, 1.7}, {1.2, 1.85}, {1.3, 1.9}, {1.4, 1.94},
 {1.5, 1.72}, {1.6, 1.43}, {1.7, 1.23}, {1.8, 1.56}, {1.9, 1.16}, {2., 1.25}}
```

```
Clear[a, c, w]
fit = NonlinearModelFit[data, a / (1 + ((x - c) / w) ^ 2), {{a, 2.5}, {c, 1}, {w, 1}}, x]
```

$$\text{FittedModel}\left[\frac{2.16987}{1+0.467867\,(-\ll 19\gg +x)^2}\right]$$

```
Show[ListPlot[data], Plot[fit[x], {x, -2, 2}]]
```



```
fit["ParameterTable"]
```

	Estimate	Standard Error	t-Statistic	P-Value
a	2.16987	0.0552674	39.2612	2.28309×10^{-32}
c	0.630755	0.0398011	15.8477	2.47027×10^{-18}
w	1.46197	0.0729791	20.0327	8.53186×10^{-22}

```
fit["BestFit"]
```

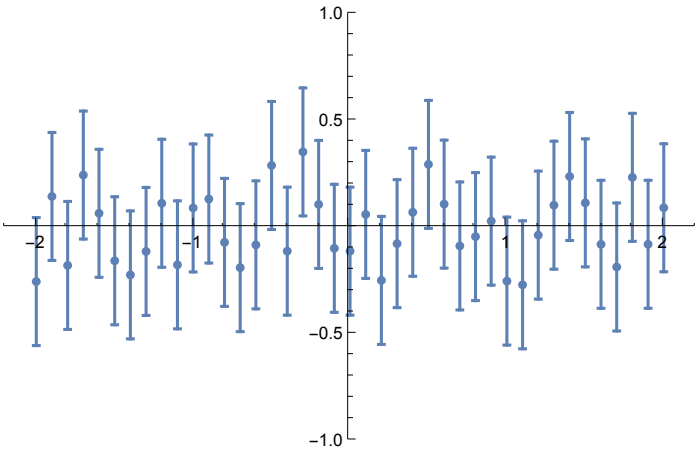
$$\frac{2.16987}{1 + 0.467867\ (-0.630755 + x)^2}$$

```
residuals = Table[data[[i, 2]] - fit[data[[i, 1]]], {i, Length[data]}]
```

```
{-0.251997, 0.147066, -0.176414, 0.247329, 0.0680423, -0.154541, -0.220703,
 -0.110733, 0.11508, -0.173546, 0.0931344, 0.134912, -0.0683461, -0.18666,
 -0.0798895, 0.292321, -0.109392, 0.355957, 0.109765, -0.0961127, -0.109349,
 0.062815, -0.246542, -0.0742123, 0.0728765, 0.297352, 0.111093, -0.0850102,
 -0.041172, 0.0313143, -0.249751, -0.267205, -0.0342065, 0.106058,
 0.240616, 0.116865, -0.0773423, -0.183681, 0.236618, -0.0772891, 0.0940773}
```

```
Needs["ErrorBarPlots`"]
```

```
ErrorListPlot[Table[{{data[[i, 1]], residuals[[i]]}, ErrorBar[0.3]},
  {i, Length[residuals]}], PlotRange → {{-2.2, 2.2}, {-1, 1}}]
```



The residual plots satisfy the criteria specified in the problem. The error bars appear to have been chosen correctly.