

Notebook to support Exercise 3.4.11, modeling a cooling potato.

The data, in time/temperature pairs:

```
In[35]:= data = {{0, 204}, {2, 193}, {4, 184}, {8, 169},  
             {10, 162}, {13, 156}, {17, 149}, {20, 143}, {24, 138}, {30, 130}}
```

The number of data points is

```
In[36]:= n = Length[data]
```

A plot:

```
In[37]:= plt1 = ListPlot[data, AxesLabel → {"time (minutes)", "Temperature "}, PlotStyle → {Red}]
```

We seek to fit a function

```
In[38]:= A = 72; u0 = 204;  
u[t_] = A + ((u0 - A)^(1 - r) + k*(r - 1)*t)^(1/(1 - r))
```

A least-squares function can be formed as

```
In[40]:= SS = Sum[(u[data[[j, 1]]] - data[[j, 2]])^2, {j, 1, n}]
```

Now adjust k and r to minimize this.

```
In[42]:= Plot3D[Log[SS], {k, 0, 0.0004}, {r, 2, 2.5}]
```