Homework 3

1. You are working for a start-up computer assembly company and have been asked to determine the minimum number of computers that the shop will have to sell to make a profit.
   The equation that gives the minimum number of computers n to be sold after considering the total costs and the total sales is
   $$f(n) = 40n^{1.5} - 875n + 35000 = 0$$
   Use the secant method of finding roots of equations to find the minimum number of computers that need to be sold to make a profit. Find the absolute relative approximate error at the end of each iteration.

2. Thermistors are temperature-measuring devices based on the principle that the thermistor material exhibits a change in electrical resistance with a change in temperature. By measuring the resistance of the thermistor material, one can then determine the temperature. For a 10K3A Betatherm thermistor,

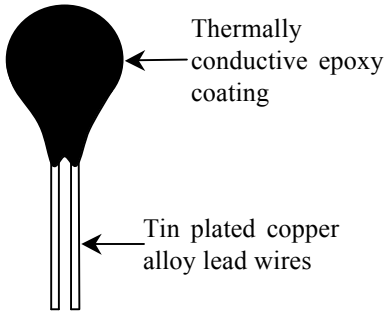

Figure 1 A typical thermistor.

the elationship between the resistance R of the thermistor and the temperature is given by
$$\frac{1}{T} = 1.129241\times10^{-3} + 2.341077\times10^{-4}\ln(R) + 8.775468\times10^{-8}\{\ln(R)\}^3$$
where T is in Kelvin and R is in ohms.
A thermistor error of no more than $\pm 0.01°\text{C}$ is acceptable. To find the range of the resistance that is within this acceptable limit at $19°\text{C}$, we need to solve
$$\frac{1}{19.01+273.15} = 1.129241\times10^{-3} + 2.341077\times10^{-4}\ln(R) + 8.775468\times10^{-8}\{\ln(R)\}^3$$
and
$$\frac{1}{18.99+273.15} = 1.129241\times10^{-3} + 2.341077\times10^{-4}\ln(R) + 8.775468\times10^{-8}\{\ln(R)\}^3$$
Use Newton's method to find the resistance R at $18.99°\text{C}$. Find the absolute relative approximate error at the end of each iteration, and plot relative approximate error versus iteration number.

Due Date: May 18, 2011