Problem Set 5

1. [6 points] Taylor 8.3

2. [6 points] Taylor 8.8
   When you do part (b), use Excel to calculate A and B. You can check your answer using chart and trendline in Excel.

3. [6 points] Taylor 8.14
   Expand the same Excel worksheet you used in the previous problem to include uncertainties in the intercept and slope.

4. [6 points] Taylor 8.22
   You can solve this system of simultaneous solutions by hand, in Matlab, or Excel.

5. [6 points] Taylor 8.25

6. [12 points] The specific heat C of metals at low temperatures is as a function of temperatures is given by
   $$C = \gamma T + BT^3. \tag{16}$$
   The term that is linear in T comes from the electronic specific heat, and the cubic term arises from the lattice interactions (also called phonons). Below you will find measurements of the specific heat at low temperatures of a ceramic superconductor called YBCO. There are two separate trials to measure the specific heat of the same sample.

T (K)	C (mJ/gK) (trial 1)	C (mJ/gK) (trial 2)
1	0.1119	0.0776
1.5	0.2244	0.32655
2	0.6058	0.604
3	2.3823	2.3136
3.5	3.4769	3.5798
4	5.278	5.0684
5	10.122	10.047
6	17.2092	17.115

   (a) We would like to know if YBCO has a non-zero electronic contribution (this means $\gamma \neq 0$). Does either trial answer this question?

   (b) Suppose we combine the two trials into one large trial. Are you better able to answer the question posed above?

Question:	1	2	3	4	5	6	Total
Points:	6	6	6	6	6	12	42
Score:							