Experimental Physics

Homework 2: Due Monday, April 8.

1. The data at the right represents the number of counts detected from a radioactive source in the indicated time intervals. Use these to estimate the lifetime, τ, of the source and give the uncertainty in the lifetime, i.e. $\tau \pm \sigma_\tau$. Use the proper number of significant digits and give the units of the results. The readings are all taken at the same time of the day on the different days. (Note that this is analogous to RC decay and you would solve it the same way. Plot ln(count rate) vs time. The slope is $-1/\tau$.)

day	time(min)	count
0	2	1036
1	2	997
2	2	890
3	2	882
4	2	792
5	2	783
6	2	768
7	2	742
8	2	698
9	2	675

2. Based on this data from #1, how many counts would you expect to get on day 12? What is the uncertainty (i.e. standard deviation) in that number based on the uncertainty in the slope and intercept?

3. If $z = 2x^3 - 4xy^2$, and the average x = 4.00m with $\sigma_x = 0.15$m and the average y = 2.50m with a $\sigma_y = 0.10$m, what is z and what is its uncertainty, i.e. standard deviation? Also include the units and give the proper number of significant figures. (Note that σ_x and σ_y are the standard deviations of the mean values of x and y.)