

**Analytical Chemistry**  
**Problem Set 2—due Monday, February 7, 2005 (at 5 p.m.)**  
**-20% per day if the assignment is late**

For the statistics problems from Chapter 4, you are not expected to calculate means and standard deviations by hand, nor write out these calculations—feel free to use the functions built into your calculator. However, you should write out your calculation of confidence intervals.

Total possible points for this assignment = 39. Remember, however, that each problem set will be equally weighed in determining your overall homework score.

1. (6 points) Harris 3-10. Two caveats: (1) You must justify (with a brief discussion) your answers. You will receive no credit for this problem if you simply write down the answers in the back of the book. (2) Contrary to Harris, I would assert that there is some random error in this measurement as well. Briefly explain my assertion.
2. (7 points) Harris 4-5. In order to receive full credit for this problem, you will need to either (1) interpolate the values in Table 4-1 (see pp. 155-156 for a description of this technique) or (2) use the NORMDIST function in the Microsoft Excel program (see pp. 65-66 for instructions). Note that correct application of technique (1) will give you an answer identical to the one in the back of the book; technique (2) will give you a slightly different value. Please see me if you need help with either of these techniques.
3. (5 points) Harris 4-14
4. (5 points) Harris 4-17
5. (6 points) Harris 4-19. Use Excel's TINV function to compute accurate values for Student's  $t$  with the appropriate number of degrees of freedom.

The Excel syntax is TINV(1-confidence level written as a decimal, number of degrees of freedom. So, for example, if you had 35 data points, and wanted Student's  $t$  at the 95% confidence level, you would type into an Excel cell

=TINV(0.05, 34)

since  $1-0.95 = 0.05$  and with 35 data points, we have  $35-1 = 34$  degrees of freedom.

Problem Set 2 continues on the back.

6. (10 points) (From the 1994 American Chemical Society examination in Analytical Chemistry)

When the  $t$ -test reveals no significant difference between an experimental mean value and the accepted value at the 95% confidence level,

- (a) no significant systematic error is likely to be present.
- (b) random error is not likely to be present.
- (c) the random error is likely to be less than the systematic error.
- (d) a different confidence level must be used.

Choose the best answer and explain why your choice is right, and other three choices are wrong.