Introduction to Mathcad Homework
CHE 371 Fall 2007

Becoming familiar with *Mathcad* will help you with homework, labwork, and even take home exam problems in the p chem. sequence. This homework assignment will help you gain comfort and expertise with the software. Some of these exercises can be easily done on a calculator, and you can use one to check your work, but use of a calculator to find answers and then entering them into *Mathcad* worksheets will lead to a 0 on this assignment.

Complete the following exercises in *Mathcad 14*, which is available on all Gustavus lab machines. Add comments as necessary to explain your work. When complete, post your worksheet to Moodle under your lab section (find the appropriate link labeled Mathcad Lab Homework).

1. Simplify the following expressions numerically:
   a. $-5+\frac{\sqrt{6}}{9}+9^2$
   b. $y = e^x - 5$ for x = 2, 4.3, and -1
   c. $\ln(3) + \tan(\pi) - 4!$

2. Some equations that will be used frequently in P Chem are the gas laws equations of state. One of these you already know, the ideal gas law: $P_{ideal} = \frac{nRT}{V}$. Another common EOS is the van der Waals equation: $P_{VDW} = \frac{nRT}{V-nb} - a\left(\frac{n}{V}\right)^2$ where a and b are gas dependent parameters. For NH_3, a is 4.304 $dm^6 \cdot bar \cdot mol^{-2}$ and b is 0.037 $dm^3 \cdot mol^{-1}$ (from McQuarrie and Simon). Using the mks unit system in Mathcad, find P_{ideal} and P_{VDW} for 1 mol of NH_3 in 1 L volume at 300 K. Be careful with your units, and use Mathcad for any conversions. Give your answer in Pa, bar, and atm.

3. Plot V vs. P_{ideal} for 1 mol of NH_3 at 300 K. Increment your volume from 0.5 L to 2 L with a 0.1 L step. On the same graph, plot P_{VDW}. (If you need help, see the *Mathcad* tutorial or Dr. Smith's *Mathcad* Intro at: http://gustavus.edu/academics/chem/pchem/mathcadintro_2001.mcd). You do not need to include units (and may find it useful to redefine variables from problem 2 without units).

4. Evaluate the following integral symbolically:
$$\int \cos^6(\theta)\sin^2(\theta)\,d\theta$$