**ChE 272 Introduction to Chemical Engineering Calculations** University of Rhode Island
Professor Greenfield Spring 2007

Homework 2
due February 8, 2007

If you find yourself without enough information, make and justify a reasonable approximation. Please answer all parts of a question! (This is good practice for an exam setting.)

1. Chapra and Canale, problem 5.2.
2. Chapra and Canale, problem 5.17.
3. Perform a variation of the class problem by searching for the temperature at which the heat capacity of ethylene equals 55.0 J/mol-K), but use the *regula falsi* method. The $C_p$ formula and $a$, $b$, $c$, $d$ parameters are shown on the class handout. Begin with initial guesses of $T = 0°\text{C}$ and $T = 1000°\text{C}$. Test your answer by plugging the temperature back into the heat capacity formula.
4. Chapra and Canale, problem 8.4
5. More calculus practice! Calculate the derivative in each case:

   (a) $dc/dt$ for a concentration $c$ that decreases with time $t$ according to

   $$c = c_0 \exp(-kt)$$

   (b) $dP^{\text{sat}}/dT$ for saturation pressure $P^{\text{sat}}$ as defined by the Antoine equation as a function of temperature $T$

   Remember, your answer should have a derivative (such as $dP^{\text{sat}}/dT$) on only one side. The other side can include one or both variables (e.g. $T$ or both $P^{\text{sat}}$ and $T$).

Late homework 2 papers will be penalized using an exponential function (as in homework 1),

$$c/c_0 = \exp(-kt)$$

Among other uses, this function is the solution to a first-order chemical rate equation,

$$\frac{dc}{dt} = -kc$$

where $c$ is the concentration and $k$ is the rate constant. As in assignment 1, $k$ = 0.06/day. The concentration $c$ corresponds to the number of possible points that can be earned, and $t$ refers to the number of days that the homework is late.