Math Review 1
(modified 9/11/2018)

http://tutorial.math.lamar.edu/Classes/CalcI/CalcI.aspx has notes and practice problems for several Calculus courses, plus an algebra review. If you get stuck on any of the questions for Math Review 1, then one of the following pages likely has helpful review. The bottom of each web page has a link to additional practice problems

- Logarithms
- Exponentials and Logarithms
- Derivatives of algebraic functions
- Derivatives of Exponentials and Logarithms
- Higher-order derivatives
- Indefinite Integrals
- Definite Integrals

Questions
Show your work to get credit!

1) At T_2= 298.15 K, water vapor has the following properties:

   Equilibrium vapor pressure = 23.751 Torr = P_2

   Enthalpy of vaporization, ΔH_{vap} = 43,990 Joules/mole

Compute the equilibrium vapor pressure of water (P_1) at T_1 = 273.15 K using the formula:

$$ln\left(\frac{P_2}{P_1}\right) = \frac{\Delta H_{vap}}{R}\left(\frac{T_2 - T_1}{T_2 T_1}\right)$$ where R=8.314 J/(mole K)

2) Find the numerical value of the following **without using a calculator.** Explain your answer in words! a) $\ln(e^5)$ b) $2 \times e^{\ln 4}$

3) Compute dy/dx for $y = 3x^5$

4) Compute the numerical value and units of the rate of reaction, d[X]/dt, for

   $[X] = 1 \text{ molar } e^{-kt}$ where $k = 12.5 \text{ sec}^{-1}$ and t =1.0 seconds.

5) Integrate the following expressions:

   a) $\int 3x^2 dx$ b) $\int_0^2 x dx$

Math Review 2

http://tutorial.math.lamar.edu/Classes/CalcI/CalcI.aspx has notes and practice problems for several Calculus courses. The topic of **partial derivatives** may not have been covered in your previous math classes. Here are links to some notes and problems. The bottom of each web page has a link to additional practice problems

Partial Derivatives
Interpretation of Partial Derivatives

Questions
Show your work to get credit!

1) For a one-component gas $dU(S,V,n) = TdS - PdV + \mu dn$.
For an ideal gas, $P=nRT/V$.
Write an expression for $\left(\frac{\partial U}{\partial V}\right)_{S,n}$ for an ideal gas that does not include any terms in P.

2) The expression for the rate of a certain reaction is $Rate = k[A][B]^2$
Write the expressions (algebraic formulas) for $\left(\frac{\partial Rate}{\partial [A]}\right)_{[B]}$ and $\left(\frac{\partial \mathrm{Rate}}{\partial [\mathrm{B}]}\right)_{[A]}$

3) In a certain range of P and T, the rate constant, k(T,P) for the reaction
$BrO + NO_2 \rightarrow BrONO_2$ has the functional form:
$k(T,P) = c \times P \times T^{-4.4}$ where c is a constant.

Write the expressions (algebraic formulas) for $\left(\frac{\partial k(T,P)}{\partial P}\right)_T$ and $\left(\frac{\partial \mathrm{k(T,P)}}{\partial \mathrm{T}}\right)_P$ (don't worry about units)

NOTE 9/11/2018: This version adds the subscripts to the partial derivatives, which indicate the variables that are being held constant. This is required for clarity.

