Exam II
Administered: Wednesday, October 5, 2016
24 points

For each problem part: 0 points if not attempted or no work shown,
1 point for partial credit, if work is shown,
2 points for correct numerical value of solution

Problem 1. (20 points)

Platinum is soluble to hydrogen. Consider the paper, "Solubility and Diffusion of Hydrogen and Deuterium in Platinum" by Y. Ebisuzaki, W. J. Kass and M. O'Keeffe, *J. Chem. Phys.* **49**, 3329 (1968); http://dx.doi.org/10.1063/1.1670604. This article quantifies the error in the diffusivity and activation energy. Let us perform our own investigation of the diffusivities of hydrogen and deuterium in platinum at 750 K based on the following set of physically reasonable but fictitious experimental data.

	Hydrogen			Deuterium	
	D	D^2		D	D^2
sample	(cm^2/s)	$(cm^2/s)^2$		(cm^2/s)	$(cm^2/s)^2$
1	0.000136492	1.86299E-08		0.000115868	1.34255E-08
2	9.28908E-05	8.62869E-09		9.37811E-05	8.79489E-09
3	0.000156639	2.45356E-08		9.90971E-05	9.82024E-09
4	0.000161559	2.61013E-08		9.66325E-05	9.33784E-09
5	0.000118485	1.40386E-08		9.12689E-05	8.33001E-09
6	6.68116E-05	4.46379E-09		8.99826E-05	8.09686E-09
7	0.000122481	1.50017E-08		9.72267E-05	9.45303E-09
sum	8.553576E-04	1.113997E-07		6.838572E-04	6.725835E-08

(a) Compute the sample mean of the diffusivity for both hydrogen and deuterium.
(b) Compute the sample variance of the diffusivity for both hydrogen and deuterium.
(c) What PDF is appropriate for determining a confidence interval on the difference of means?
(d) Find the lower limit on a 98% confidence interval on the difference of means.
(e) Find the upper limit on a 98% confidence interval on the difference of means.
(f) Translate your conclusions from (d) and (e) into a sentence that a non-statistician can understand.
(g) What PDF is appropriate for determining a confidence interval on the ratio of variances?
(h) Find the lower limit on a 95% confidence interval on the ratio of variances.
(i) Find the upper limit on a 95% confidence interval on the ratio of variances.
(j) Translate your conclusions from (h) and (i) into a sentence that a non-statistician can understand.

Problem 2. (4 points)

What is the probability that the average diffusivity of hydrogen is greater than the average diffusivity of deuterium.