Exam II
Administered: Friday, October 9, 2015
26 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)

Students have used 3-D printers to create two sets of plastic dogbones for mechanical property testing. The first set is composed of polypropylene (PP) and contains 6 samples. The second set is composed of acrylonitrile butadiene styrene (ABS) and also contains 6 samples. A tensile test is performed on each dogbone, from which the ultimate tensile strength (UTS) is obtained. The values of the UTS are reported below. (The squares and the sums are redundant but are provided simply to aid in quick calculation.)

	PP			ABS	
	UTS	UTS^2		UTS	UTS^2
sample	(MPa)	(MPa^2)		(MPa)	(MPa^2)
1	31.73708	1007.242		37.09827	1376.281
2	36.18769	1309.549		38.03443	1446.618
3	38.11509	1452.76		39.45385	1556.606
4	39.79226	1583.424		38.02751	1446.091
5	34.51379	1191.201		37.18759	1382.917
6	35.19065	1238.382		42.13335	1775.219
sum	215.5366	7782.559		231.935	8983.733

(a) Compute the sample mean of the UTS for both the PP and ABS sets.
(b) Compute the sample variance of the UTS for both the PP and ABS sets.
(c) What PDF is appropriate for determining a confidence interval on the difference of means?
(d) Find the lower limit on a 95% confidence interval on the difference of means.
(e) Find the upper limit on a 95% 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 90% confidence interval on the ratio of variances.
(i) Find the upper limit on a 90% 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. (6 points)

A particular tensile strength tester places four dogbone samples in parallel. A constant stress is applied over an extended period of time. The time to failure of an individual dogbone is known to follow the exponential distribution with a mean lifetime of 20 minutes.

(a) What is the probability that an individual dogbone sample hasn't yielded before 10 minutes?
(b) What PDF would describe the probability that all 4 dogbones haven't yielded before 10 minutes?
(c) What is the probability that all 4 dogbones haven't yielded before 10 minutes?