# STAT W4201 001, Homework 3

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Code is attached here and also posted at https://github.com/BrianWeinstein/advanced-data-analysis. Where relevant, code snippets and output are are included in-line.

**Problem 1: Ramsey 4.30**

**Problem 2: Ramsey 4.32**

**Problem 3: Ramsey 5.19**

**Problem 4:**

*Consider the Bumpuss data in Chapter 2, compute the power of the two-sided two sample t-test of size 0.05 (i.e., reject the null hypothesis if the absolute value the t-statistic is greater than or equal to 2), under the alternative that* $\mu_x - \mu_y = \overline{x} - \overline{y} = 0.01$ *and* $\sigma = s_p = 0.0214$.

**Problem 5:**

*Show that the two-sided two sample t-test is equivalent to the anova F-test, if the number of groups is two.*

**Problem 6:**

*Consider* $X_1, \ldots, X_{10}$ *are i.i.d.* $N(0, \sigma^2)$, $Y_1, \ldots, Y_{10}$ *are i.i.d.* $N(\mu, \sigma^2)$ *and hypothesis testing:*

$$H_0 : \mu = 0$$
$$H_A : \mu \neq 0.$$

*Compute the power of a two sided two sample t-test of size 0.05 when* $\sigma^2 = 1$ *and* $\mu = 0.1, 0.5, 1,$ *and 2. Plot the power as a function of* $\mu$. *Then, increase the sample size in each group to 20 and draw the power function in the same plot as that of the sample size 10.*

**Problem 7:**

*Under the setting of the previous problem, show that, under the null hypothesis, the p-value follows the uniform distribution on the interval [0, 1] and perform simulations to confirm it.*