**BIOL 121 Data Challenge 1 - 2016 (15 points)**

You are tasked to perform data analyses of two different ecological datasets. The first data set is Dipteran (aka true flies, such as mosquito larvae) larvae abundance in Dream Lake from 2004-2015. The second data set is the Day of first flowering for the invasive species musk thistle (*Carduus nutans*) vs. temperature.

**Part 1. Dipteran Larvae Abundance in Dream Lake (2004-2015)**

1. Use the knowledge that you gained from the Excel tutorials to calculate **average** Dipteran larvae abundance in Dream Lake from 2004-2015.
   1. Write the generic function for calculating an average in Excel (i.e. how would you write the function [aka equation] in the cell):
   2. Average Dipteran larvae abundance from 2004-2015 is: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Use the knowledge that you gained from the Excel tutorials to calculate the **variance** of Dipteran larvae abundance in Dream Lake from 2004-2015.
   1. Write the generic function for calculating variance in Excel (i.e. how would you write the function [aka equation] in the cell):
   2. Variance of Dipteran larvae abundance from 2004-2015 is: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. Graph the data using the appropriate type of graph so that you can determine the Dipteran larvae abundance over time. Perform a regression analysis to determine the rate of change and the total change. Copy and paste your graph here.
   1. Rate of change is: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   2. Total change is:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   3. Statistically interpret the linear model based on the regression analysis.
   4. Write a biological interpretation of the data.

**Part 2. Day of First Flowering for Musk Thistle (*Carduus nutans*) vs. Temperature**

1. Use the knowledge that you gained from the Excel tutorials to calculate the **average** day of first flowering for Musk Thistle and the average temperature.
   1. Average of the day of first flowering for Musk Thistle is: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   2. The average temperature is: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Use the knowledge that you gained from the Excel tutorials to calculate the **variance** of first flowering day data for Musk Thistle and the variance in temperature data.
   1. The variance in the day of first flowering data for Musk Thistle is: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   2. The variance in the temperature data is: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. Graph the data using the appropriate type of graph so that you can determine the day of first flowering for Musk Thistle vs. temperature. Perform a regression analysis to determine the rate of change and the total change. Copy and paste your graph here.
   1. Rate of change is: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   2. Total change is:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   3. Statistically interpret the linear model based on the regression analysis.
   4. Write a biological interpretation of the data.