BIOCOMPUTING FINAL PROJECT

1. Things to Do

- Analyze antibiotics.txt using an ANOVA-design linear model and likelihood ratio test.
  - Generate a plot to summarize the results of the experiment.
  - Write code to perform an ANOVA test comparing the three different treatments and the control.
  - Wirte a markdown document to summarize the results of the ANOVA test and make conclusions about hypotheses.
- Analyze sugar.txt using a regression design linear model and likelihood ratio test.
  - Generate a plot to summarize the results of the experiment.
  - Using a regression-design linear model and a likelihood ratio test, test for significance of treatment.
  - Write a markdown document to summarize the results and make conclusions about hypotheses.
- Perform a statistical power analysis comparing ANOVA and regression-designed experiments.
  - Assume a variable y depends on an independent variable x with slope $\beta_1 = 0.4$ and a y-intercept of $\beta_0 = 10$.
  - Compare regression-design to a two-level ANOVA with 24 experimental units.
    * Simulate 10 random experiments with a regression design for $\sigma \in \{1, 2, 4, 6, 8, 12, 16, 24\}$ for $x \in [0, 50]$.
    * Simulate 10 random experiments with a two-level ANOVA design $\sigma \in \{1, 2, 4, 6, 8, 12, 16, 24\}$ $x \in [0, 50]$.
  - Compare regression-design to a four-level ANOVA with 24 experimental units.
    * Simulate 10 random experiments with a regression design for $\sigma \in \{1, 2, 4, 6, 8, 12, 16, 24\}$ for $x \in [0, 50]$.
    * Simulate 10 random experiments with a four-level ANOVA design $\sigma \in \{1, 2, 4, 6, 8, 12, 16, 24\}$ $x \in [0, 50]$.
  - Compare regression-design to an eight-level ANOVA with 24 experimental units.
    * Simulate 10 random experiments with a regression design for $\sigma \in \{1, 2, 4, 6, 8, 12, 16, 24\}$ for $x \in [0, 50]$.
    * Simulate 10 random experiments with an eight-level ANOVA design $\sigma \in \{1, 2, 4, 6, 8, 12, 16, 24\}$ $x \in [0, 50]$.
  - Write a MarkDown file summarizing results
    * How did the ANOVA vs regression design perform?
      · Use the average p-values from the liklihood ratio tests across Monte-Carlo simulaitons as a metric of statistical power
    * Does the relative performance of the experimental designs depend on the number of levels in the ANOVA experiment?