MTH 324, Final Exam, At Home, Fall 2023 Name _____

Instructions: This exam is in two parts: Part I is to be completed partly at home using the materials posted in the course for the at-home portion and you will answer questions about that work during the in-class portion of the exam; Part II is to be completed entirely in class. You may not use cell phones, and you may only access internet resources you are specifically directed to use.

At home, prepare for questions in Part I using R. Open the data file entitled **324final_data.xlsx** posted in Blackboard. (Note: this file has multiple sheets of data. You may want to separate the data into separate files to upload to R, or look up how to access multiple sheets in R from a single upload.) Complete the calculations noted below. You will be asked for additional analysis and interpretation of this data in the in-class portion of the test. Print out the results of your analysis and code, and bring the pages with you to the exam. You will submit all this work along with the in-class exam.

1. Using the data on Sheet 1, conduct appropriate hypotheses of the data on Sales of two products. Conduct a parametric version of the test, and a nonparametric version. Is there sufficient reason to think one product sales is more than the other? Test any assumptions of the hypothesis test you choose, and be prepared to explain your reasoning why you chose the test you did.

2. The data on Sheet 2 is complex with 12 variables (Person is not a variable).
   a. Explore the data. Make a graph of each variable. Use an appropriate graph for each variable type. For numerical variables, you'll need to be able to describe the shape of the distribution. Bar graphs or pie charts are appropriate for categorical data, or you can experiment with mosaic charts or others that you think display the individual variables well.

   b. Create summary statistics for the numerical variables.

   c. Create a Two-way table for Dwell Type and Pay Type. Conduct a test of independence on this data.

   d. Create a comparative box plot of Weight and Neighborhood. Conduct an ANOVA test on this data. If you reject the null, apply Tukey's method or pairwise comparisons as appropriate.

   e. Use bootstrapping to test whether there is good reason to think average Income is more than $45,000. Construct a confidence interval with this method, and using a traditional one-sample method. Compare the results.

   f. Construct a two-way table of Gender and Pay Type. Conduct a two-sample proportion test to see if the proportion of people living alone differs by gender.

3. The table below shows the results of a simulation of the sum of rolls of two pairs of dice using 492 trials.

	2	3	4	5	6	7	8	9	10	11	12
Count	14	25	38	60	68	91	61	64	34	19	18

Dice rolls follow a triangle distribution, with $P(X = 2) = \frac{1}{36}$, which increases linearly to $P(X = 7) = \frac{6}{36}$, and then decreases linearly to $P(X = 12) = \frac{1}{36}$. Conduct a goodness-of-fit test to see if this data appears to follow this distribution.