Math 310 Winter 2021 Test 2 Due Sunday March 28th at midnight.

Your work should be typed and submitted through Canvas.

1. One property of automobile air bags that contribute to their ability to absorb energy is the permeability ($ft^3/ft^2/min$) of the woven material used to construct the air bags. Understanding how permeability is influenced by various factors is important for increasing the effectiveness of air bags. In one study, the effects of three factors, each at three levels, were studied. A(Temperature):$8°, 50°, 75°$. B(Fabric denier): 420-D, 630-D, 840-D. C(Air pressure): 17.2 kPa, 34.4 kPa, 103.4 kPa. Analyze this data and state your conclusions. Assume all factors are fixed.

2. The appraisal of a warehouse can appear straightforward compared to other appraisal assignments. A warehouse appraisal involves comparing a building that is primarily an open shell to other such buildings. However, there are still a number of warehouse attributes that are plausibly related to appraised value. The attached data on truss height (ft), which determines how high stored goods can be stacked, and sale price ($) per square foot.

   (a) Is it the case that truss height and sale price are deterministically related?

   (b) Construct a scatterplot of the data. What does it suggest?

   (c) Determine the equation of least squares

   (d) Give a point of prediction of price when truss height is 27 ft. and calculate the corresponding residual.

   (e) What percentage of observed variation of sale price can be attributed to the approximate linear relationship between truss height and price?

3. The accompanying data was read from a scatterplot in the article "Urban Emissions Measured with Aircraft." The response variable is ΔNO_y and the explanatory variable is ΔCO

   (a) Fit an appropriate model to the data

   (b) Predict the value of ΔNO_y that would result from making one more observation when ΔCO is 400. What is the prediction interval? Does it appear that ΔNO_y can be accurately predicted? Explain.

   (c) The largest value of ΔCO is much greater than the other values. Does this observation appear to have had a substantial impact on the fitted equation?

4. Show that SSE $= S_{yy} - \hat{\beta}_1 S_{xy}$, which gives an alternative computation for SSE.

5. Using the iris data set that is built into R, determine which explanatory variables, if any, predict whether the species is setosa or not. Develop at least four models and use your method of choice for determining which is the best at predicting the outcome.