**Assignment 2**

**BA830**

**Due Date: 3/29 at noon**

[Rocket Fuel (110 points)](#_hro0kazdjvh6)

[How long did this problem set take you in hours? How did you find the level of difficulty? [1 point]](#_riv14xet91ud)

**Instructions: Please use assignment2\_notebook.Rmd and rocketfuel\_data.csv to do this assignment.**

**REMINDER: Please label your answers when you submit the assignment on Gradescope. I will take points off if you don’t**

**Before you submit the pdf, please make sure that the text is readable. For some of you, the written answer spilled over the right side of the screen. To prevent this from happening, make sure to write your answer in the Markdown, not in the code chunk..**

### Rocket Fuel (110 points)

Please read the case about RocketFuel from the HBS Case Pack <https://hbsp.harvard.edu/import/750625>

**Remember to write out your answers in words, don’t just output R statistics.**

1. Did the campaign cause more purchases? Is this difference statistically significant? Use the t.test function. (10 points)  
   Clarification: You can use a two-sided test.
2. Was the campaign profitable?
   1. How much **more profit** did TaskaBella make by running the campaign (excluding advertising costs)? (8 points)  
      Hint: The case contains some numbers that will allow you to do this calculation.
   2. What was the cost of the campaign? (8 points)  
      ### Hint: The cost per thousand impressions is $9
   3. Calculate the ROI of the campaign. Was the campaign profitable? (8 points)
   4. What was the opportunity cost of including a control group; how much more could TaskaBella have made by not having a control group at all? (8 points)
3. Did the number of impressions seen by each user influence the effectiveness of advertising?
   1. Create a chart of conversion rates as a function of the number of ads displayed to users. Plot conversion rates for those who were in the control group and for those who were exposed to the ad. Group together number of impressions as necessary to obtain a meaningful plot. (Conversion rate means the percentage of users who made a purchase.) (8 points)
   2. What can you infer from the charts? For what conversion number was advertising most effective? (8 points)
   3. Based on the above figure, suggest a follow-up experiment. What is the treatment and what is the control? Answer should be 1 paragraph. (8 points)
4. Calculate the power of this experiment.
   1. Calculate cohen’s D. This is the treatment effect on conversion divided by the standard deviation of conversion. (8 points)
   2. Use the pwr.t2n.test function, inputting the cohen’s d. (8 points)
   3. What would the power be instead if the true effect had a cohen's of .01? (4 points)
   4. What would the power be instead if the true effect had a cohen's of .01 and the sample was equally split between treatment and control? (4 points)
5. Case Discussion in Class (20 points)  
   Please write what you would discuss in your presentation to TaskaBella. Your answer should be 2 paragraphs. Be prepared to discuss in class (part of the grade).

### How long did this problem set take you in hours? How did you find the level of difficulty? [1 point]