Math and Engineering Design Challenge Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Rollercoaster Riding Dream Field trip Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

In our Math and Engineering Design Challenge, we will be working with a wide variety of technological applications. We will be gathering a great amount of data which must be organized and analyzed. Microsoft *Excel* will be an important tool that will aid us in the process. Thus, we must all be familiar with the software. The following activity will help you learn how to set up, format, and write formulas to help with the analysis of your group’s rollercoaster data.

Please open up the “Rollercoaster Riding Dream Field Trip Template” on the Math & Engineering: Cross Curricular Project Based Learning webpage. Then complete the spreadsheet by following the directions below:

1. Make sure you are working in the “From MHS to . . . .” sheet and then go to *Google Maps* to find the

 driving *time in hours* and the *distance in miles* from Mayfield High School to each amusement park. (Multiple routes will pop up; pick any one of them.) Enter the values into columns B & C.

 \*\*\*Note: *Google Maps* gives the time in hours and minutes. You will have to convert the time into hours. Use this example as a guide: 4 hours 28 minutes Type: =4+28/60 Enter

2. Select both cells B1 and C1 through B6 and C6. **Insert** a **Scatter** **with only Markers** (we don’t want the points connected). Then under **Chart Layouts**, choose **Layout** 3. Right-click on the trendline and then click on the two boxes so that both the equation of the line and the *r*2 value are displayed. Label the axes of your graph appropriately.

 (What does the slope of your line represent? If you answered that question, you just did a little calculus! ☺)

3. Now click on B9 and enter a formula that will find the sum of cells B2 through B6. Then use that cell to

 find the value that goes in cell B11. Enter a formula in B13 to find the average time.

4. Select cells B9 & C9 and then **fill right** to create a formula for the Total Distance (One Way). Repeat the process to calculate the values in C11 & C13.

5. Call the Heinl over to check your spreadsheet before you move on.

For the next part of this activity, consider the following scenario:

 Dr. Ward has determined that the Math and Engineering Design Challenge has been so successful that it is worth venturing not just to Cedar Point to map out their rollercoasters, but also the other amusement parks listed on our spreadsheet as well. Therefore, he is giving the OK as well as providing the funds for us to travel to all five parks! (Thank you Dr. Ward!) Of course we need to know how much time to allow for travel as well as the number of miles we will be driving (by luxury coach, of course!). Please complete the remainder of your spreadsheet to determine these totals.

6. Now select the “Field Trip Totals” sheet. You will need to go back to Google Maps to find the distances as well as travel times from park to park. Enter the values into columns B & C.

7. Enter a formula referencing cells from columns B and D in cell D3 to calculate the total driving time

 from MHS to Cedar Point (yes, you can do that in your head, but . . . .). Highlight cells D3 through D8 and then **Fill down**. Now your formula will be applied to all cells in that column. Then do a **Fill right** to paste the formulas to cells E3 through E8.

8. Do a search to find the elevations in feet for each destination. Enter those values in column F.

9. Call the Heinl over to check your spreadsheet before you move on.

10. Select and copy cells D2 through F8. Then click on the “Graphs” sheet and paste the contents into cells A2 through C8.

11. Create three scatterplots on this sheet illustrating the following: total distance driven vs. altitude; total driving time versus total distance driven; and total driving time versus altitude. Find the best-fitting trendline for each graph and make sure the equations and *r*2 values are displayed. Label the axes for

 each graph appropriately.

12. Two out of the three equations you found in step 11 represent the parametric equations representing the distance traveled in terms of time and the attitude in terms of time. Write one equation for the former for *x* in terms of *t.* Write the latter for *y* in terms of *t*. Then enter the pair into your TI *n*-Spire and create a graph. Adjust the window accordingly. Compare the graph in your calculator to the total distance driven vs. altitude in your spreadsheet. How do they compare?