Homework 3

Due: March 7

Instructions: Please answer the following questions with well thought out answers. Write your answers on a separate sheet of paper. STAPLE this sheet to the front of your answers. It is important to be able to explain ideas clearly. In this assignment pretend that you are trying to explain to a friend your answers. You should strive for your answers to be: precise, accurate, succinct, and understandable.

Question 1 Air quality in Salt Lake City is of concern. Particulate matter, or PM, is the term for particles found in the air, including dust, dirt, soot, smoke, and liquid droplets. Particles can be suspended in the air for long periods of time. Some particles are large or dark enough to be seen as soot or smoke. Others are so small that individually they can only be detected with an electron microscope.

Many man-made and natural sources emit PM directly or emit other pollutants that react in the atmosphere to form PM. These solid and liquid particles come in a wide range of sizes.

Particles less than 10 micrometers in diameter (PM_{10}) pose a health concern because they can be inhaled into and accumulate in the respiratory system. Particles less than 2.5 micrometers in diameter ($PM_{2.5}$) are referred to as "fine" particles and are believed to pose the greatest health risks. Because of their small size (approximately $1/30^{th}$ the average width of a human hair), fine particles can lodge deeply into the lungs.

The annual standard for $PM_{2.5}$ is met whenever the 3 year average of the annual mean $PM_{2.5}$ concentrations for designated monitoring sites in an area is less than or equal to $15.0 \ \mu g/m^3$.

For example, if in three successive years the mean $PM_{2.5}$ concentrations were $18.0 \ \mu g/m^3$, $12.0 \ \mu g/m^3$, and $12.0 \ \mu g/m^3$, then the three-year average would be $14.0 \ \mu g/m^3$, and the annual standard for $PM_{2.5}$ is met.

The attached sheet is data from the Salt Lake area for January 2013. The columns represent measurements taken from different sites.

1. Graph the data from two of the sites, Rose Park = RP, and one other of your choosing.

2. Draw smooth curves that best fit each set of data.

3. Use the curve for the Rose Park data to interpolate what the $PM_{2.5}$ for January 7, 2013. Explain the process you used to find an estimate.

4. Draw the graph of the function $f(x) = 15$ on top of your two graphs. What does that graph represent?

5. How many days in January 2013 did Rose Park experience air quality with more $PM_{2.5}$ particles more than $15 \mu g/m^3$? How did you use your graph to calculate that?

6. What will the monthly average have to be for the next 35 months so that Rose Park meets the annual standard? Explain your process to find the average for the next 35 months.