CS361 HW1

Problem 1

1. The total points of the 5 students is #of students \* their mean score = 5 \* 10 = 50 points.

To minimize the top scores, we make the lowest scores 9, 9, 9, and the 2 highest scores have a sum of 50 – 9\*3 = 23. To minimize, we can make the top scores 12 and 11, respectively.

1. To maximize the top score, we minimize the lowest 2 scores to be both 0, and we make the second highest score 9 to conform to the median. We have maximized the highest score to be 50 – 2\*9 = 32
2. The Minimum standard deviation is achieved when every data point is closest to the mean value of the dataset, which is 10. The lowest 3 scores then would have to be 9. Let the highest score = x, then the second highest score = 50 – 3 \* 9 – x = 23 – x. We need to minimize: f(x) = (x-10)^2 + (23 – x – 10)^2. Taking derivative of f(x), we could get that x = 12. The minimum standard deviation = sqrt(1/5 \* (1+1+1+1+4)) = 1.265
3. The maximum standard deviation is achieved when every data point deviates the furthest away from the mean. A data set consisting of 0, 0, 9, x, 41-x will be good. We need to maximize: (x-10)^2 + (31-x)^2. After differentiating, we got x = 20 or 21. The maximum standard is then sqrt(1/5\*(1 + 10^2 + 10^2 + 10^2 + 11^2)) = 9.187

Problem 2

1. The mean of the standardized coordinates is 0, plug in the formula for the standard deviation, we get the same numerator and denominator, and therefore, the standard deviations are both 1 for xi-head and yi-head
2. Because the mean of the data set is 0, the median is smaller than the mean, the data is right skewed.

Problem 3

1. Yes, there is at least one outlier in this data, as shown in the plot. (near top-right)

[Insert Plot Here]

1. According to the result computed by code, the mean cost of a power plant is 461.560313, and the standard deviation is 167.44
2. According to the result computed by code, the mean cost per megawatt is 0.5697, and the standard deviation is 0.184
3. [insert histogram here] It is not skewed(symmetric) because the mean very close to the median. There are more data points aggregated to the left of the graph.