HW 5

3.3a)

Most of the scores are between 20 & 30 with a mean of 25. The lowest X-value is 19 & the highest is 35

3.3b)

Most of the residuals are between -1 & 1. There are a hanful that are less than -1 & one that is greater than 1.

3.3c)

Most of the residuals are close by the 0 line & are between 1 & -1. While there are some outliers, we are led to believe the error variance is constant. And while there may be a bit of a $-x^2$ pattern, it still looks like a linear regression function would work

3.3d)

The normal probability plot looks symmetrical with heavy tails. The correlation coefficient is 0.974, the p-value is small, & the confidence interval is between 0.983 & 0.982. with this information, I conclude that there is a positive linear relationship

3.3e)

decision rule

H_0: $|t^*_{bf}| > t(0.995, 118) = 2.62$

H_a: $|t^*_{bf}| \leq 2.62$

$|t^*_{bf}| = 0.95 \leq 2.62$, H_a true

The test proves that the errors are constant (which matches with 3.3c

3.3 f)

Intelligence doesn't seem to be an improvement the model. But class rank might due to the residuals being constant variance & a linear regression model seeming appropriate

3.8 a)

The plot shows that most of the highschool diploma percentages are between 70% & 89%

3.8 b)

It seems pretty symmetrical as the mean is basially 0 & the values are between -2,000 & 2,000

3.8 c)

The residual plot seems to show that that the error variance is constant & that a linear regression model is appropriate

3.8d)

Based on the normal probability plot being symmetrical (except for some outliers at the tails) & the cor. coefficient being 0.989, we can say that a linear regression model seems appropriate

3.8e)

decision rule

$H_0: |t_{bf}^*| > 1.99$

$H_a: |t_{bf}^*| \leq 1.99$

$|t_{bf}^*| = 0.92 \leq 1.99$, H_a = true

Thus the error variance is constant

3.9)

the problem is with the linearity of the function. Smaller X-values have larger, positive residuals, medium X-values have negative residuals, & then larger X-values are back to positive residuals. A transformation could work here as transformations can be used to linearize non-linear data.

3.11a)

The plot has a "megaphone" pattern; thus, implying that the error variance is non-constant

3.11b)

alternatives	decision rule
H_0: error variance = constant;	$X^2_{BP} \leq X^2(0.95,1) = 3.84$
H_a: error variance $\neq$ constant;	$X^2_{BP} > 3.84$

$X^2_{BP} = 6.60 > 3.84$, H_a = true which is what 3.11a found as well