Stat 346 Homework 2

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1 Problem 1

1.1 Part a

The residuals are not normally distributed, indicating a nonlinear relationship. Possible fixes include nonlinear regression or a transformation on X.

1.2 Part b

These residuals seem to be normally distributed with constant variance. This indicates that the model is a good fit.

1.3 Part c

The errors are not normally distributed. This might be fixed with a transformation on Y.

1.4 Part d

The variance on the residuals is not constant. This might be fixed with a transformation on Y.

2 Problem 2

2.1 Part a

Plots 2.1 and 2.1. The residuals seem normally distributed and support a linear trend.

2.2 Part b

$s\{b_1\} = 2.125 \times 10^{-2}$
$t(1 - 0.05/2, 16 - 2) = t(0.975, 14) = 2.145$
$b_1 = 0.47833 \pm 2.145 * 2.125 \times 10^{-2}$
$(0.43275, 0.52392)$

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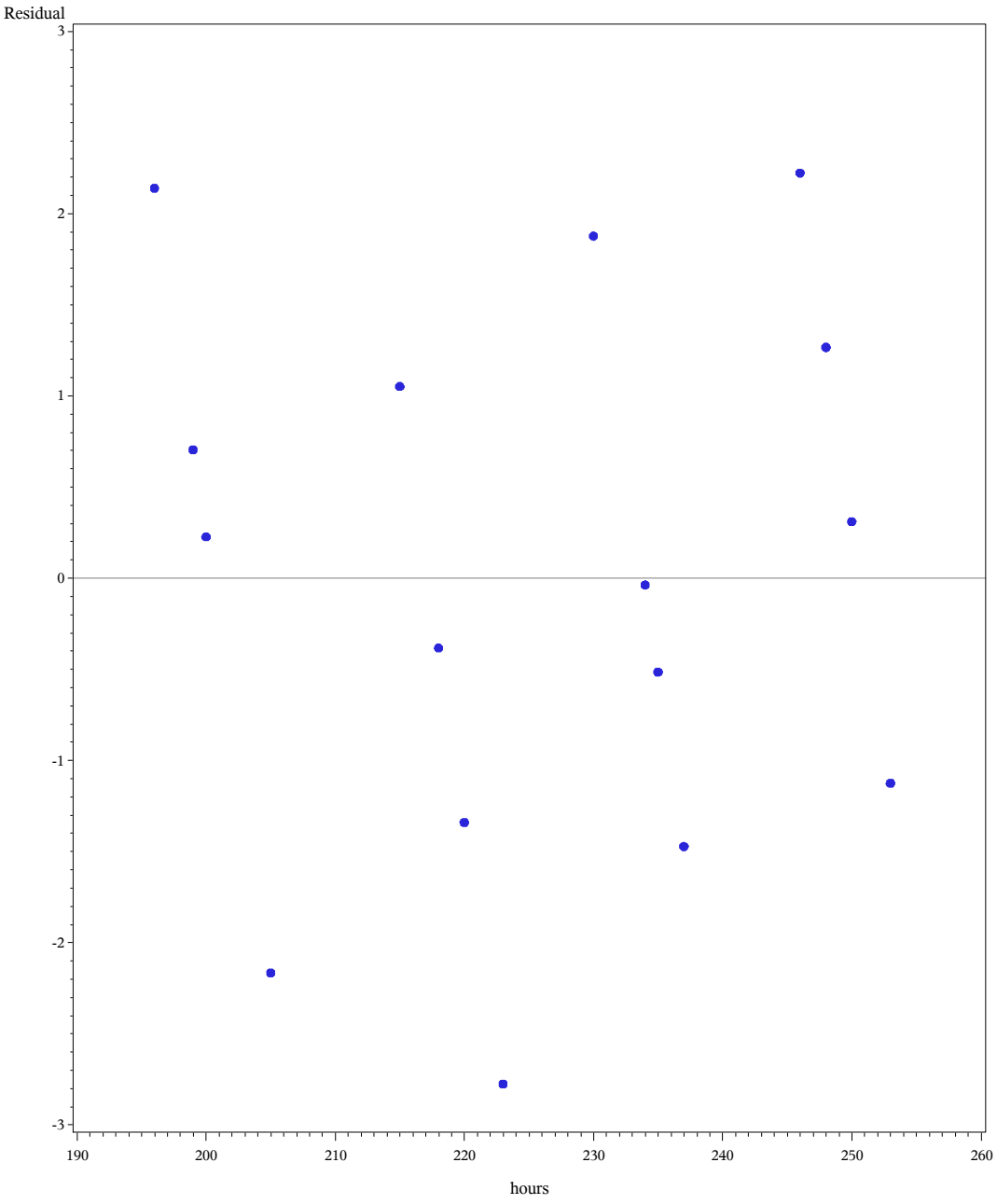
Plastic Hardness
Residuals vs. time



Plastic Hardness
Normal Probability

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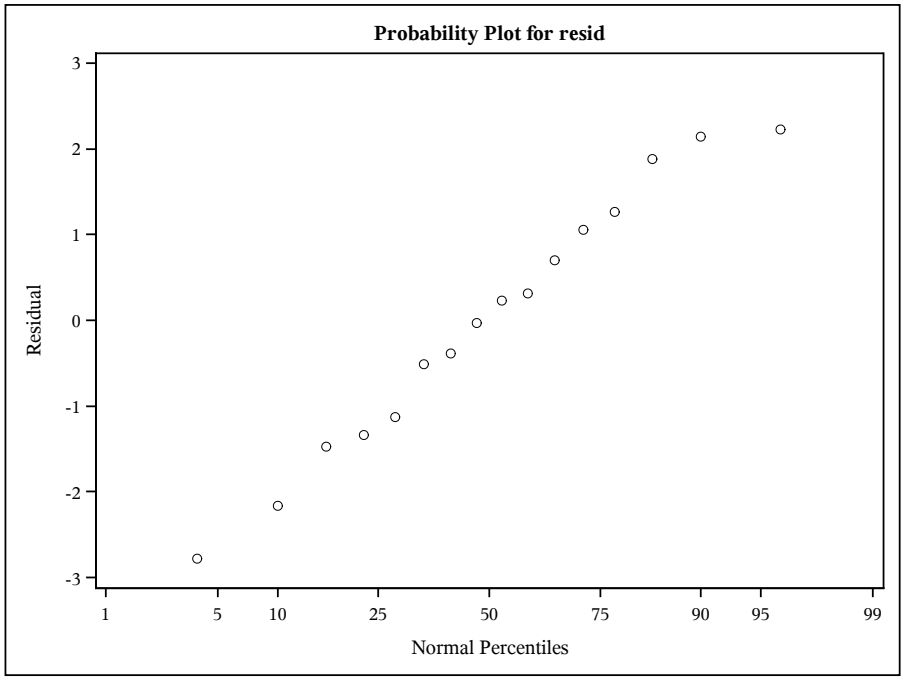

2.3 Part c

$\hat{Y} = 37.7759$
$s\{\hat{Y}\} = 0.5851$
$\hat{Y} \pm t(1 - 0.05/2, 16 - 2)s\{\hat{Y}\} = 2.145 * 0.5851$
$(36.5209, 39.0309)$

2.4 Part d

$R^2 = 1 - \frac{SSE}{SSTO} = 1 - \frac{34.342802}{1280} = 0.9731$

2.5 Part e

1. General Linear Test
2. ANOVA
3. T-test

3 Problem 3

3.1 Part a

	ORIGINAL REGRESSION	REGRESSION WITH OUTLIER
Fitted Regression Equation	$\hat{Y} = 2.11405 + 0.03883X$	$\hat{Y} = 3.04977 + 0.00090502X$
R-Square	0.0726	0.0011
MSE	0.38829	0.41822
$SE\{b_1\}$	0.01277	0.00250
P-Value	0.0029	0.7178

3.2 Part b

Plots 3.2 and 3.2 for the original dataset. Plots 3.2 and 3.2 for the edited dataset.
The residuals plot is much more extreme.

3.3 Part c

Yes, you could construct a sequence diagram over the dates, or perhaps school years, at which the GPA and ACT scores were collected.

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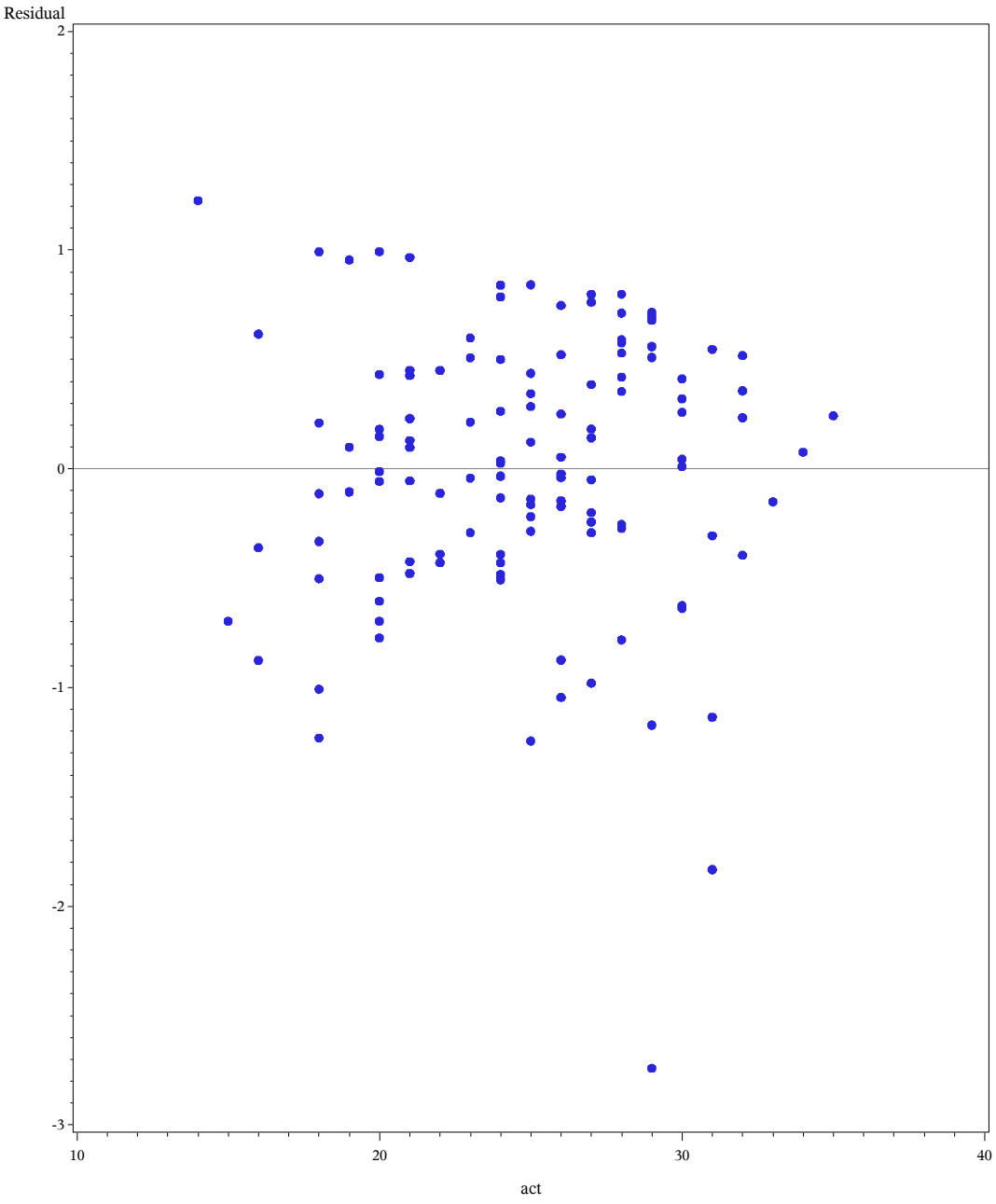
GPA and ACT
Residuals vs. time



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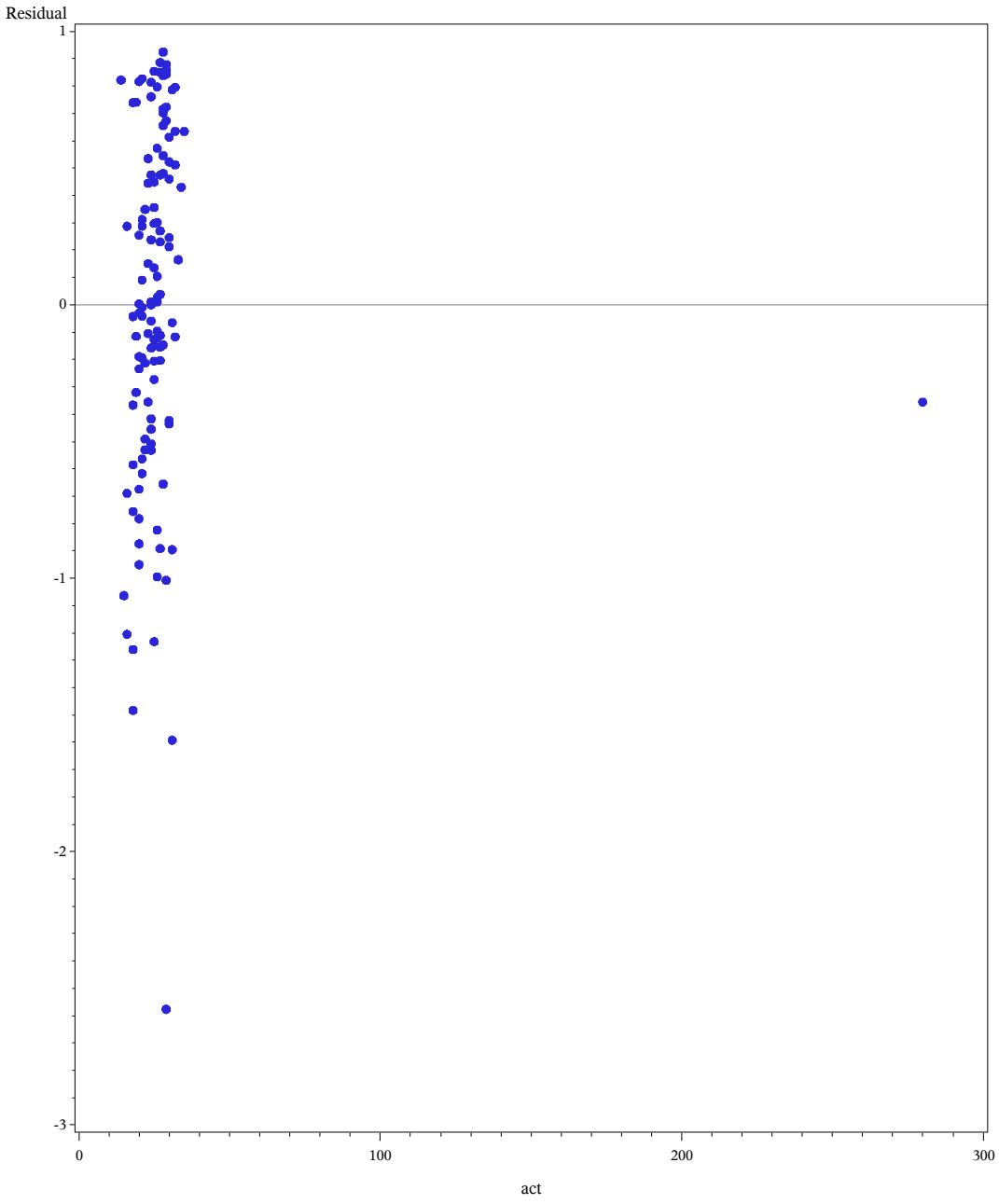
GPA and ACT with typo
Residuals vs. time



GPA and ACT
Normal Probability

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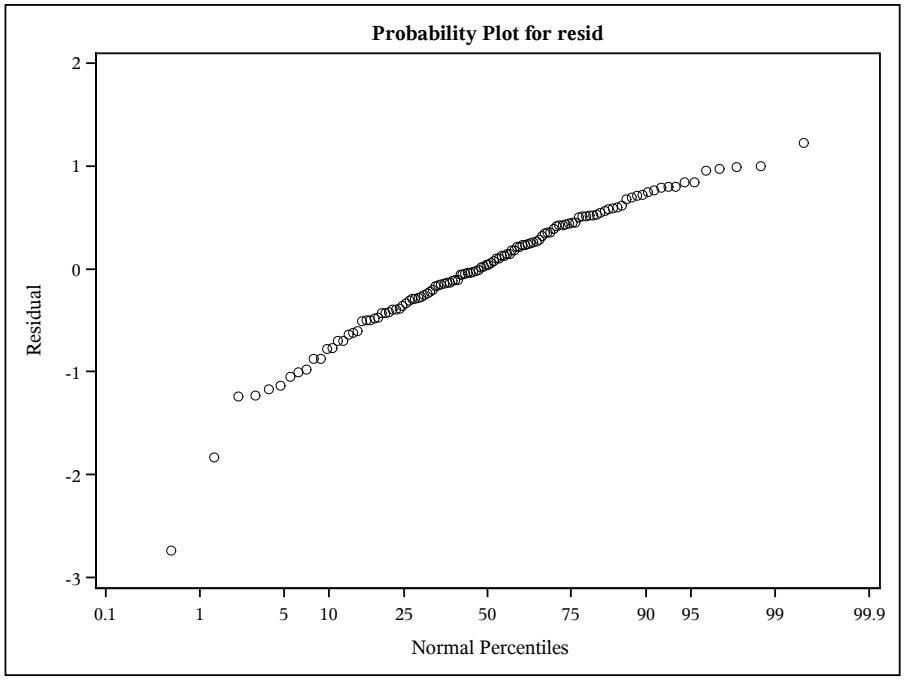

GPA and ACT with typo
Normal Probability

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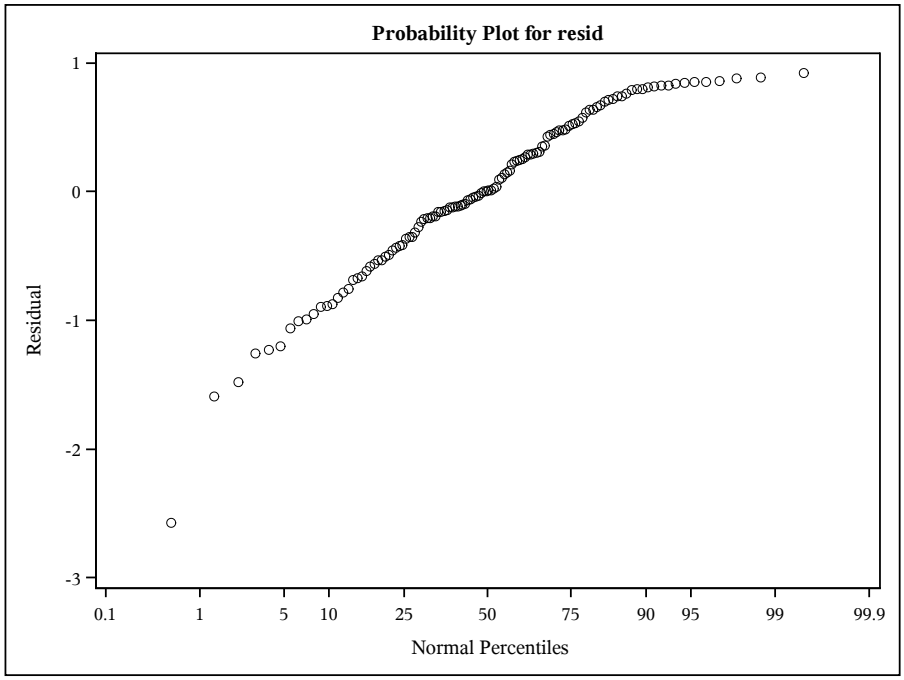

4 Problem 4

5 Problem 5, KNN #3.23

Full Model:

$$Y_{ij} = \mu_j + \epsilon_{ij} \tag{1}$$

Degrees of freedom: $n - c$

Reduced Model:

$$Y_{ij} = \beta_1 X_j + \epsilon_{ij} \tag{2}$$

Degrees of freedom: $n - 2$