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MAT 300 Module 6 Homework

a) Fit this model to the 12 data points given in the table, and find the regression residuals

Using Minitab, the fitted linear model is

$$\text{DEMAND} = 99.8 + 0.0452 \times \text{PRICE}.$$

The residuals are:

Table 1: Predicted Values and Residuals for Demand Regression

PRICE	**DEMAND**	**Predicted ($\hat{y}$)**	**Residual**
100	130	104.33	25.67
700	150	131.43	18.57
450	60	120.14	-60.14
150	120	106.59	13.41
500	50	122.40	-72.40
800	200	135.95	64.05
70	150	102.98	47.02
50	160	102.08	57.92
300	50	113.37	-63.37
350	40	115.62	-75.62
750	180	133.69	46.31
700	130	131.43	-1.43

b) Plot the residuals against retail price per carat, x

The residual vs. PRICE plot shows residuals starting positive at low prices (50–150), becoming negative at moderate prices (300–500), and returning to positive at high prices (700–800), forming a U-shape.

c) Can you detect any trends in the residual plot? What does this imply?

The residual plot exhibits a U-shaped trend, indicating the linear model is inadequate. This suggests a quadratic model ($y = \beta_0 + \beta_1 x + \beta_2 x^2$) is needed to capture the theorized demand behavior (decreasing at low prices, leveling off at moderate prices, increasing at high prices).

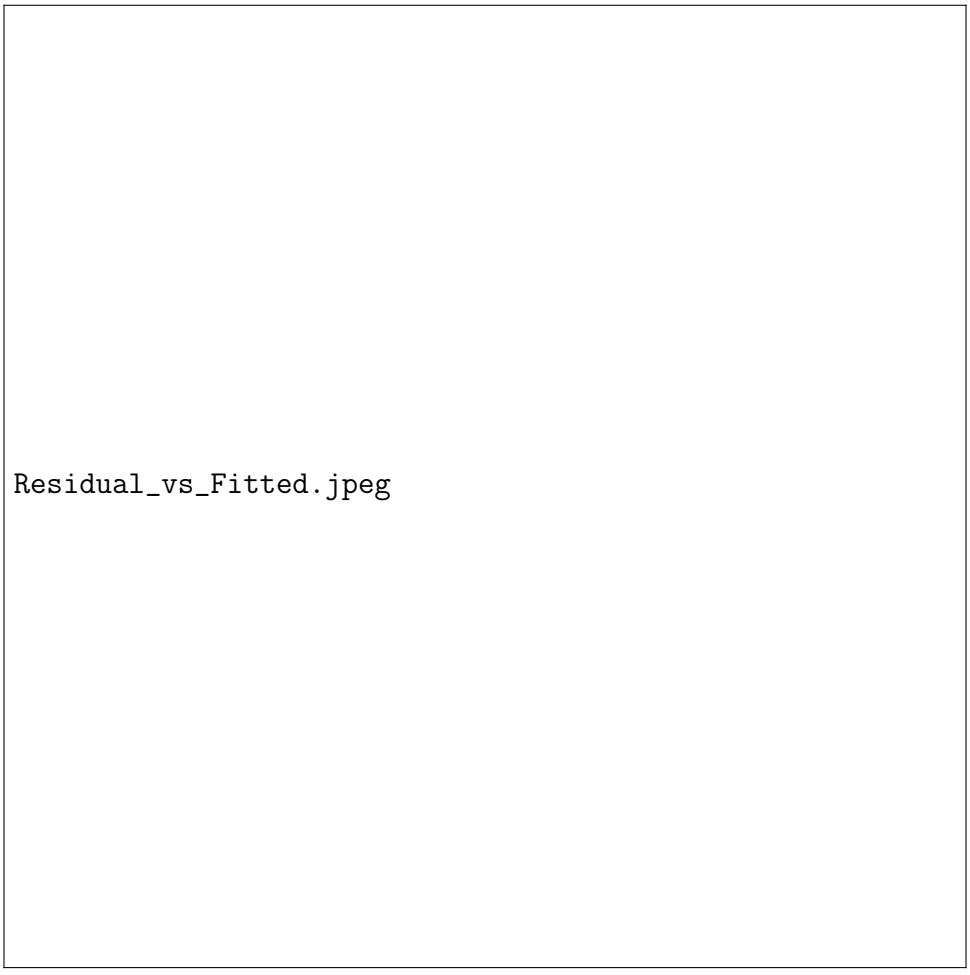

Figure 1: residual vs. fitted