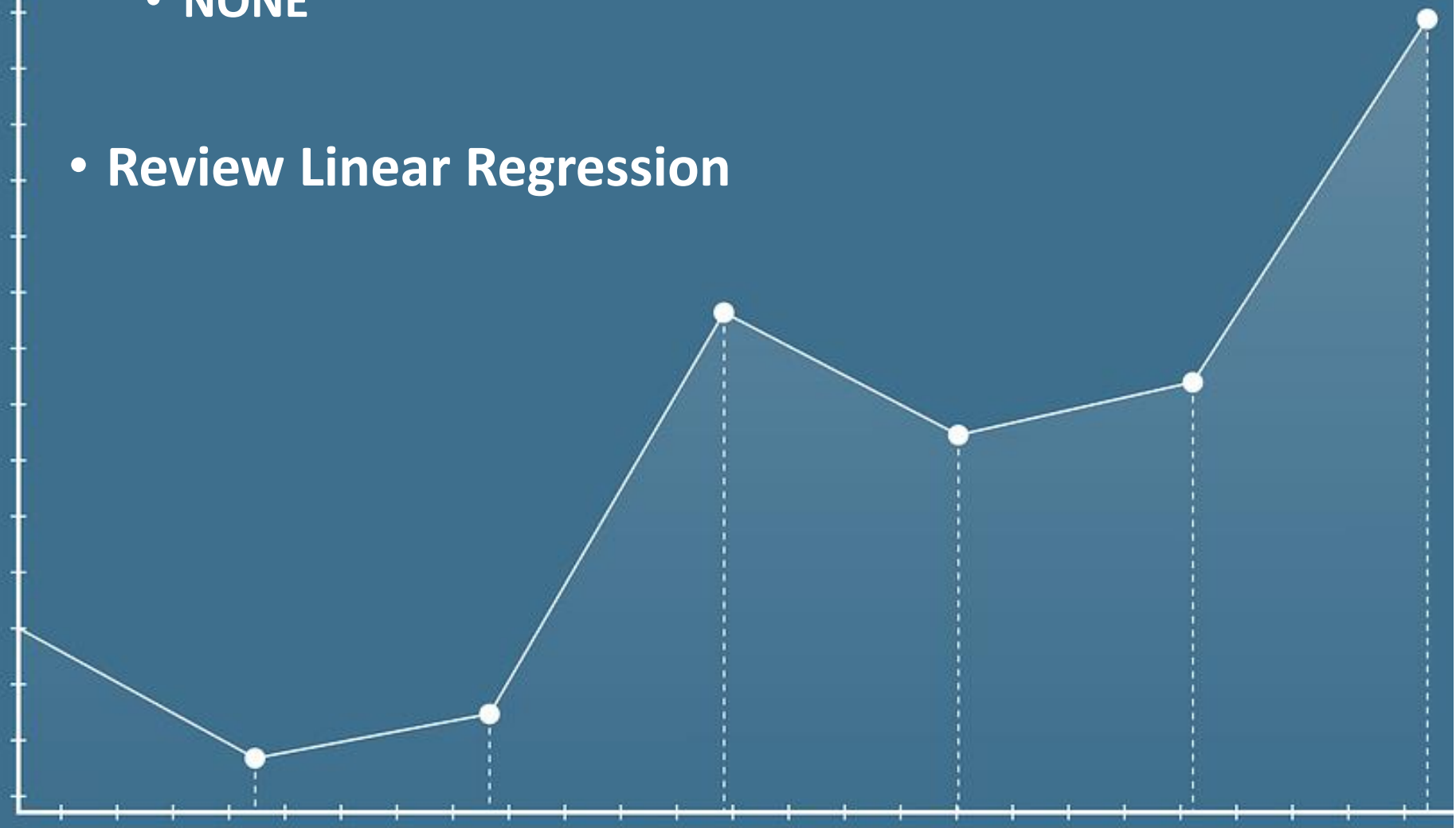
Monday, December 17, 2018

- **Warm-up**
  - **NONE**

- **Review Linear Regression**



Using the formulas

$\widehat{calc} = -27.275 + 0.613\,physics$

$\hat{y}$ x

At her high school, Sara Bellum is enrolled in both physics and calculus. The scores on the physics final exam are approximately normally distributed with a mean of 175 points and a standard deviation of 12. The scores on the calculus final are also approximately with a mean of 80 and a standard deviation of 8. It is also known that the correlation between the physics and calculus grades is 0.92. Sara scored 181 on the physics final. Predict what her score would be on the calculus final.

$\hat{y} = b_0 + b_1 x$

$b_0 = \bar{y} - b_1 \bar{x}$

$b_1 = r \frac{S_y}{S_x} = 0.92\left(\frac{8}{12}\right)$

$= 0.613$

$b_0 = 80 - 0.613 \cdot 175$

$= -27.275$

$\widehat{calc} = -27.275 + 0.613(181)$

$= 83.67$

Interpret Slope & Y-intercept

slope $\frac{\Delta y}{\Delta x} \rightarrow \frac{\text{calc}}{\text{physics}}$

- $\widehat{calculus} = -27.275 + \underline{0.613}physics$

For every 1 pt. increase in physics score, we predict 0.613 pt. increase in calculus.

y-int
x=0

With a physics score of zero, I predict a calculus score of -27.275.

Residuals

predicted = 83.67

- $\widehat{calculus} = -27.275 + 0.613physics$

Her actual score was an 80%

actual (observed) − predicted

$80 - 83.67 = -3.67$

step 1

find predicted

R^2

84% of the variation in calculus scores can be predicted the variation in physics scores

- It is also known that the correlation between the physics and calculus grades is 0.92

$R^2 = 0.84$

$\sqrt{.84} = \pm 0.92$

correlation must match direction positive/negative slope

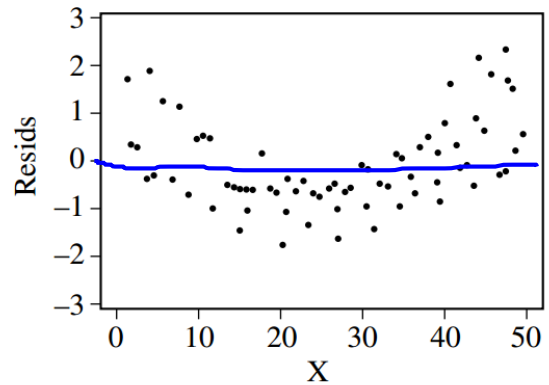
strength & direction

What does a residual plot tell us?

21. The residual plots from five different least squares regression lines are shown below. Which of the plots provides the strongest evidence that its regression line is an appropriate model for the data and is consistent with the assumptions required for inference for regression?

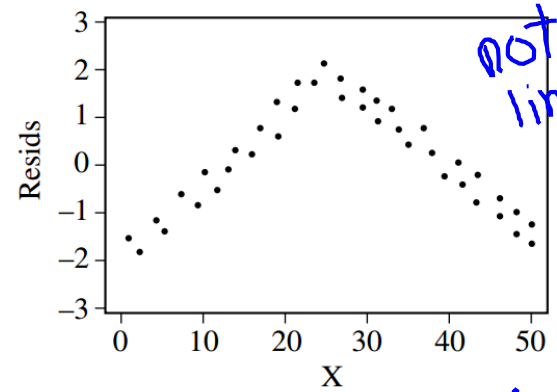
(A)

not linear



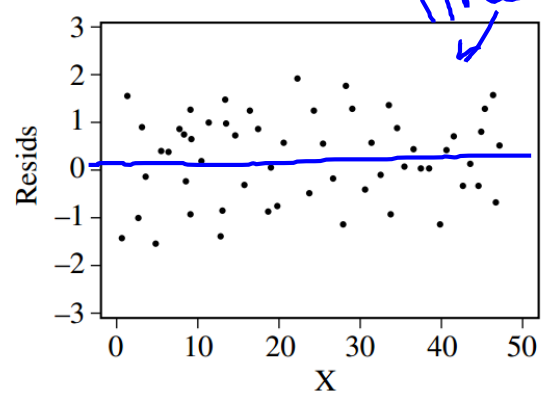
(B)

not linear



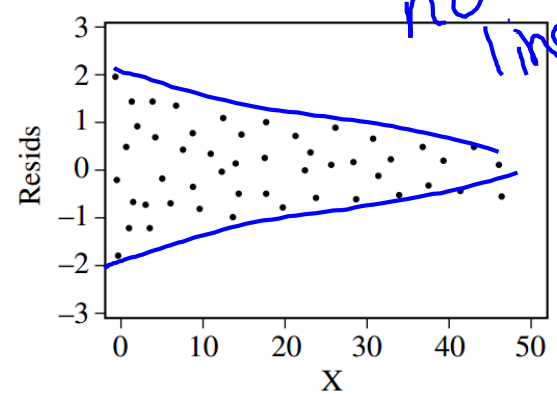
(C)

linear

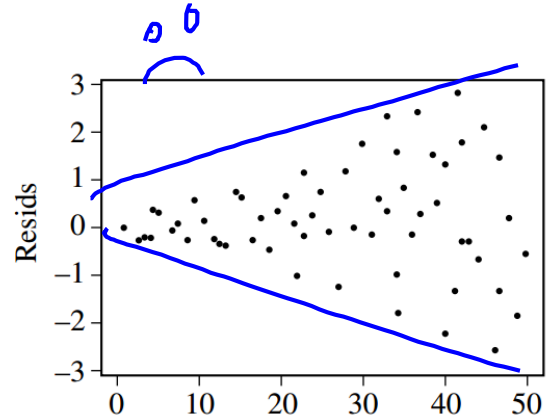


(D)

not linear



(E)



Thoughts on Transformations

A regression of y vs. x was performed, and the least squares line is $\widehat{\sqrt{y}} = 5.218 - 0.197x$. What is the prediction when x = 10?

$\frac{1}{\hat{y}} \rightarrow$

$\widehat{\sqrt{y}} = 5.218 - 0.197(10)$

$\left(\widehat{\sqrt{y}}\right)^2 = (3.248)^2$

$\hat{y} = 10.549$

$\frac{1}{y} = 3.248$

$y =$

$10^{\hat{y}} \rightarrow \log$

$\log y \rightarrow 10^{x}$

Multiple Choice

Standardized test statistic $= \dfrac{\text{statistic} - \text{parameter}}{\text{s.d.}}$

3 times → 1st → answer quick ones

○ circle = yes, time

? guess

2nd → circles

3rd → ?'s

extrapolation . . .