Section 8-3 Regression for Nonlinear Data

Linear Regression does not fit very well here. How can you tell? ① line doesn't go through middle of data as well as the curve

② coefficient of determination (r^2) is better (closer to 1) for the exponential function

This is a scatterplot of fish weight, y, versus length, x.

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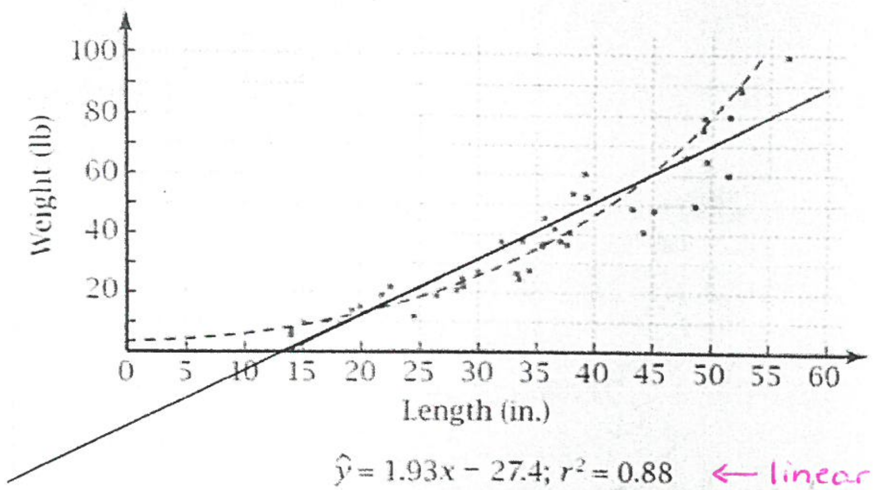

$\hat{y} = 1.93x - 27.4$; $r^2 = 0.88$ ← linear

$\hat{y} = 4.29 \cdot (1.06)^x$; $r^2 = 0.91$ ← exponential

$r = \pm 0.954$ → use pos. value because function is increasing

Figure 8-3c

Since the data curves upward, a reasonable model would either be an exponential function or a power function. To decide which of the two is more reasonable, consider the **endpoint behavior.** (The graph at the left side of the domain should contain the origin, why?)

* with the exponential function above, it shows that a fish of 0" in length will weigh ≈2 lbs. This doesn't make sense.

Power regression gives $y = 0.0606x^{1.7990}$ where r = 0.9669

A fish of 0" in length should weigh 0 lbs., so (0,0) should be part of function. Power fits this endpoint behavior.

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* enter x + y into L_1 + L_2 + create a scatterplot (Plot 1 → ON, ZOOM #9)

a.) No, so $x \neq 0$, so use power function because exp. functions have y-intercepts

$r = -0.967$ for exp.

$r = -0.999$ for power

} * closer to 1 (or −1) is better

b.) power function fits more data points

c.) $A = l \cdot w$ → we can put this in L_3

$w \to L_1$, length → need to use # lines $\left(l = \frac{\#\text{ lines}}{7} = \frac{L_2}{7}\right)$

$\therefore L_3 = \left(\frac{L_2}{7}\right) * (L_1)$

** To graph Area as a function of width: Area = y, Width = x so $L_3 = y$, $L_1 = x$

MUST CHANGE IN CALC → $\boxed{2^{nd}}\boxed{y=}$

* To run linear regression:

  - calculator uses L_1 + L_2 unless you tell it otherwise, so 'tell it' to use x-list → L_1 + y-list → L_3
  - $r = -0.788$