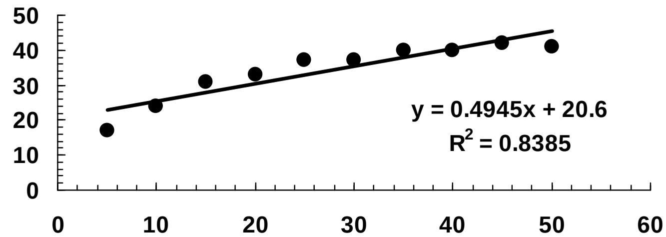
Solution 17.16

(a) We regress y versus x to give

$y = 20.6 + 0.494545x$

The model and the data can be plotted as



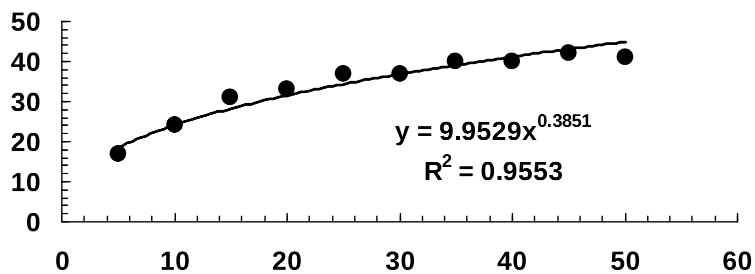
(b) We regress $\log_{10}y$ versus $\log_{10}x$ to give

$$\log_{10} y = 0.99795 + 0.385077 \log_{10} x$$

Therefore, $\alpha_2 = 10^{0.99795} = 9.952915$ and $\beta_2 = 0.385077$, and the power model is

$$y = 9.952915x^{0.385077}$$

The model and the data can be plotted as



(c) We regress $1/y$ versus $1/x$ to give

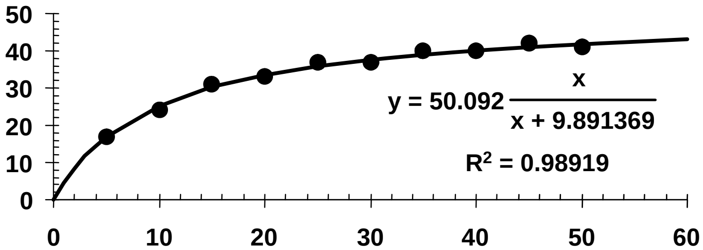
$$\frac{1}{y} = 0.019963 + 0.197464\frac{1}{x}$$

Solution continued on the next page...

Therefore, α_3 = 1/0.01996322 = 50.09212 and β_3 = 0.19746357(50.09212) = 9.89137, and the saturation-growth-rate model is

$$y = 50.09212 \frac{x}{9.89137 + x}$$

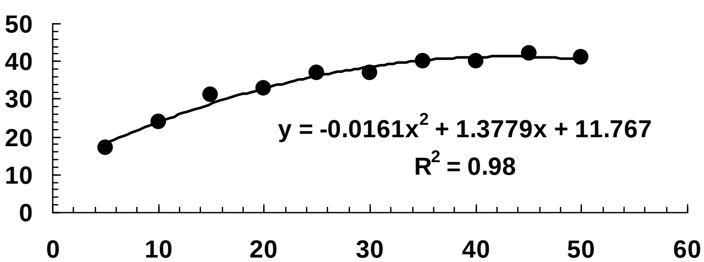
The model and the data can be plotted as



(d) We employ polynomial regression to fit a parabola

$$y = -0.01606x^2 + 1.377879x + 11.76667$$

The model and the data can be plotted as



<u>Comparison of fits:</u> The linear fit is obviously inadequate. Although the power fit follows the general trend of the data, it is also inadequate because (1) the residuals do not appear to be randomly distributed around the best fit line and (2) it has a lower r^2 than the saturation and parabolic models.

The best fits are for the saturation-growth-rate and the parabolic models. They both have randomly distributed residuals and they have similar high coefficients of determination. The saturation model has a slightly higher r^2. Although the difference is probably not statistically significant, in the absence of additional information, we can conclude that the saturation model represents the best fit.