\[
\text{observed} = \text{model} + \text{error} \quad \text{observed} = \text{fitted} + \text{residual}.
\]

1. Data: pairs \((x_i, y_i)\) of quantitative variables.

2. Some functions related to the linear model (\(\text{fitted}, \text{residuals}\))

3. How do we know a linear model is wrong?

4. Suppose the model is a nonlinear function. Two strategies:
   
   (a) Fit it directly
   
   (b) Transform the relationship to a linear one (re-expression)

5. Example:

6. Common transformations: logs, inverses, powers

**Homework**

1. Read Sections 1.6.4.

2. Do problems 1.29,30. In problem 1.30, consider only the treated observations. (Due Monday, February 16)

**Useful R**

\[
\begin{align*}
> & \text{logs}=\log(\text{mentrack}\$\text{Seconds}) \; \text{; logm}=\log(\text{mentrack}\$\text{Meters}) \; \text{; l=lm(logs}^\text{-logm}) \\
> & l=\text{lm(I(log(Seconds))}^\text{-I(log(Meters))),data=mentrack})
\end{align*}
\]