A second approach to fitting non-linear functions is minimizing RMSE!

1. Non-linear model for the relationship between $x$ and $y$: \[ y = f(x) \]

\[
\text{Observation} = \text{Model} + \text{Error} \quad \text{Observation} = \text{Fitted} + \text{Residual}\]

2. Instead of linearizing, minimize the sums of squares of residuals.

\[ > \text{nls(Seconds}^\text{~(A} \times \text{Meters}^\text{B)}, \text{start=list(A=0.1,B=2),data=mentrack)} \text{Nonlinear regression model} \]
\[ \text{model: Seconds} \text{~ (A} \times \text{Meters}^\text{B)} \]
\[ \text{data: mentrack} \]
\[ \begin{array}{c|c|c}
A & B \\
\hline
0.08395 & 1.06864 \\
\end{array} \\
\text{residual sum-of-squares: 168.1} \]
\[ \text{Number of iterations to convergence: 18} \]
\[ \text{Achieved convergence tolerance: 1.877e-07} \]


4. The difference between the two solutions (linearization and direct minimization)

Homework

1. Do problem 3.4.30

2. Repeat 3.4.30b except fit the nonlinear function directly by minimizing the sums of squares of residuals. Compare the fitted model to that of the fitted model from the linearization.