DSC 241 – Homework 1

Problem 1. Write a function confBand(x, y, conf=0.95) taking in a predictor vector $(x_1, \ldots, x_n)$ and a response vector $y = (y_1, \ldots, y_n)$ and return a plot with the points $(x_1, y_1), \ldots, (x_n, y_n)$, the least squares line, and the confidence band at level conf. Apply your function to hp and mpg from the 04cars dataset.

Problem 2. Let $n = 100$ and draw $x_1, \ldots, x_n \overset{\text{iid}}{\sim} \text{Unif}(0, 1)$, which stay fixed in what follows. Repeat the following experiment $N = 1000$ times.

- Generate $y_i = 1 + x_i + \varepsilon_i$, with ε_i i.i.d. $\mathcal{N}(0, 0.2)$.
- Compute the 99% confidence band and record whether it contains the true line, or not.

Summarize the result of this numerical experiment by returning the proportion of times (out of N) that the confidence band contained the true line.