ASSIGNMENT #3

EPsy 8252

This assignment covers vector geometry and matrix algebra. Please submit your responses to each of the questions below in a printed document. Please adhere to the following guidelines for formatting your assignment:

- All graphics should be resized so that they do not take up more room than necessary and all should have an appropriate caption.
- Any typed mathematics (equations, matrices, vectors, etc.) should be appropriately typeset within the document using Equation Editor, Markdown, or LaTeX.
- All syntax included should be typeset in a monospaced font, appropriately commented and follow the Data Camp Style Guide (`https://teach.datacamp.com/style-guide`).

Use the data, *Sex-Discrimination.csv*, to complete the assignment. There are 20 points possible for the assignment. Each question is worth one point, unless otherwise noted.

Effects Coding

Compute the following means from the data.

1. Compute the marginal mean for salary.
2. Compute the mean salary (conditional means) for females and the mean salary for males.
3. Compute the *grand mean* for salary (i.e., the mean of the conditional means).

Create two effects-coded vectors for the `sex` variable (`sexM`, and `sexF`) using the coefficients -1 and $+1$. For the `sexM` predictor, males should be coded $+1$ and females should be coded -1. The coding for `sexF` should be reversed.

1. Compute the angle between the `sexM` and `sexF` vectors. Show your work. **(2pts)**
2. Using R, compute the correlation between the two vectors. Verify that the angle you computed in #1 is correct.

Fit the linear model: `salary ~ 1 + sexF`.

3. Write out the **b** vector.
4. Interpret the intercept coefficient.
5. Interpret the slope coefficient.
6. Using matrices, compute the fitted values for a male and a female. Show your work. **(2pts)**

Fit the linear model: `salary ~ 1 + sexM`.

7. Write out the **b** vector.
8. Interpret the intercept coefficient.
9. Interpret the slope coefficient.

10. Using matrices, compute the fitted values for a male and a female. Show your work. **(2pts)**

Fit the linear model: `salary ~ sexF + sexM`.

11. Write out the **b** vector.

12. Explain using vector geometry why `NA` is produced for one of the coefficients. **(2pts)**