Talis Biomedical Statistics Course - Homework 3

Due: 11 December 2019 11:59 PM

Name: [your first and last name]
Collaborators: [list all the people you worked with]
Date: [date of submission]

By turning in this assignment, I agree by the **Stanford honor code** and declare that all of this is my own work.

Linear algebra

Many of the following problems are out of a textbook by Friedberg et al and is available online at https://ulissesgtz.files.wordpress.com/2019/02/stephen-h.-friedberg-arnold-j.-insel-lawrence-e.-spence-linear-algebra-pearson-2014.pdf.

Problem 1

When is it true? Fill in each blank with '*always*', '*sometimes*', or '*never*'.

(a) A nonsingular matrix is _____ invertible.

(b) A square matrix is _____ full-rank.

(c) If $\mathbf{AB} = 0$, then $\mathbf{BA}$ is _____ a zero matrix.

(d) The rank of $\mathbf{A} + \mathbf{B}$ is _____ greater than $rank(A)$.

(e) If $\mathbf{A}^2$ is invertible, then $\mathbf{A}$ is _____ invertible.

(f) If the linear equation $\mathbf{y} = \mathbf{Ax}$ has a unique solution, then $\mathbf{A}$ is _____ square.

Problem 2

True or False. Fill in each blank with '*True*' or '*False*'.

(a) A diagonalizable matrix $\mathbf{A}$ is nonsingular. _____

(b) A nonsingular matrix $\mathbf{A}$ is diagonalizable. _____

(c) A positive square matrix $\mathbf{A}$ is positive definite. _____

(d) A square matrix $\mathbf{A}$ with real and positive eigenvalues is positive definite. _____

Problem 3

From Friedberg et al:

(a) Section 4.3: Exercise 1(d) & 1(h)

(b) Section 4.3: Exercise 22(a) & 22(c)

(c) Section 4.4: Exercise 3(f)

Problem 4

From Friedberg et al:

(a) Section 5.1: Exercise 1(c)

(b) Section 5.2: Exercise 1(i)

Problem 5

From Friedberg et al:

(a) Section 6.1: Exercise 1(g)

(b) Section 6.1: Exercise 16(b)

(c) Section 6.7: Exercise 1(a)

(d) Section 6.7: Exercise 3(b)

(e) Section 6.7: Exercise 6(b)