Math 324/524 Homework 4
YOUR NAME
Due 3/4/20

Submit well-organize solutions to the following exercises You may work together however you MUST NOT copy one another. Your final submission MUST be written in your own words. It is unacceptable and unethical to look up the answers online.

1. List the names of all people (students, TA's, Professors) with whom you spoke about this assignment. There are no restrictions for how many people you spoke to and no negative repercussions to just chatting. **You're encouraged to fill this space up.

2. What is the contrapositive, converse, inverse, and negation of the statement.
   Claim. If A is a nonsingular matrix of order n then A is row equivalent to I_n.

   (a) **Contrapositive:**

   (b) **Converse:**

   (c) **Inverse:**

   (d) **Negation:**

3. Let A, B and C all be $n \times n$ matrices. Prove that if $AC = BC$ and $A \neq B$, then C is singular.

   Proof.

□

4. Section 2.1 Exercise 77: Let A and B be $n \times n$ matrices. Show that if the ith row of A has all zero entries, then the ith row of AB will have all zero entries.

   Give an example using 2×2 matrices to show that the converse is not true. (Also, write down the converse.)

   Proof.

   □

5. Section 2.2 Exercise 66: Let A and B be two $n \times n$ symmetric matrices.

   (a) Give an example to show that the product AB is not necessarily symmetric.

   (b) Prove that AB is symmetric if and only if $AB = BA$.

   Proof. ($\Rightarrow$)

   ($\Leftarrow$)

   □

6. Section 2.3 Exercise 71: Prove that if A is invertible and $AB = O$, then $B = O$.

Proof.

□

7. Section 2.4 Exercise 54: Prove that A is idempotent if and only if A^T is idempotent.

Note: This exercise is a *guided proof*, meaning the textbook has the proof steps written out. Use them.

Proof. ($\Rightarrow$)

($\Leftarrow$)

□

8. Section 2.4 Exercise 57: Prove that if A is row-equivalent to B and B is row-equivalent to C, then A is row-equivalent to C.

   Note: This exercise is a *guided proof*, meaning the textbook has the proof steps written out. Use them.

   Proof.

□