Textbooks: In the assignment, the two texts are abbreviated as follows:


1. Section 2.3 of [FIS], Problem 1.
2. Section 2.3 of [FIS], Problem 2.
3. Find two matrices $A, B \in \mathcal{M}_{2\times 2}(\mathbb{R})$ where $AB$ is the zero matrix but $BA$ is not.
4. Section 2.3 of [FIS], Problem 3.
5. Section 2.3 of [FIS], Problem 4 (a), (b).
6. Section 2.4 of [FIS], Problem 1.
7. Suppose $A$ and $B$ are invertible $n \times n$ matrices.
   (a) Prove that $(AB)^{-1} = B^{-1}A^{-1}$.
   (b) Prove that $(A^t)^{-1} = (A^{-1})^t$.
8. Prove Theorem 2.21 of [FIS]. This shows that any finite dimensional vector space $V$ of dimension $n$ is isomorphic to $\mathbb{R}^n$.
9. (a) Let $A$ and $B$ be $n \times n$ matrices such that $AB$ is invertible. Prove that both $A$ and $B$ are invertible.
   (b) Give an example of two noninvertible matrices whose product is invertible.
   (c) Prove or give a counterexample: If $A$ and $B$ are nonzero $n \times n$ matrices with $AB$ the zero matrix then $A$ is not invertible.
10. Find the inverse of the following matrix, and check your answer two different ways.

$$A = \begin{pmatrix} 2 & 1 & 2 \\ 1 & -1 & 0 \\ 4 & -2 & 1 \end{pmatrix}.$$