LE 200 Homework #3

Please show all details of your solutions.

1. Kreyszig's 7.9 3-10 (2)

2. Kreyszig's 7.9 11-14 (2)

3. Find the four fundamental spaces of matrices in Kreyszig's 7.4 1-10 (3)

4. *V* is the vector space of all (2×2) matrices and **A** has the form

$$\mathbf{A} = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$$

Determine whether the function $T: V \rightarrow R^1$ is a linear transformation.

- (i) T(A) = a + 2b c + d
- (ii) $T(\mathbf{A}) = tr(\mathbf{A})$, where $tr(\mathbf{A})$ denotes trace of \mathbf{A}
- (iii) T(A) = (a-d)(b-c)

For a linear transformation, also determine the range and null spaces.

5. Project the vector $\mathbf{b} = [3 \ 4 \ 4]^{T}$ onto the line through $\mathbf{a} = [2 \ 2 \ 1]^{T}$ and then onto the plane that also contains $\mathbf{a}' = [1 \ 0 \ 0]^{T}$. Find the projection matrix for each case. Check that the first error vector is perpendicular to \mathbf{a} and the second one is perpendicular to both \mathbf{a} and \mathbf{a}' .