List of key points for Mid 2, MTH 309

- Sec 3.1
  - Euclidean vector spaces $\mathbb{R}^n$
  - Polynomial vector spaces P_n
  - Verifying whether a given set is a vector space or not by the definition (C1,C2 and A1-A8 will be provided).
- Sec 3.2
  - Definition of vector subspace;
  - Subspace of $\mathbb{R}^n$ and P_n
  - Null space of an $m \times n$ matrix
  - Linear combination and the span of vectors $v_1, \cdots, v_n$ (in $\mathbb{R}^n$ and P_n)
  - Spanning set of $\mathbb{R}^n$, P_n and their subspaces
  - Using determinant to check whether n vectors $v_1, \cdots, v_n$ in $\mathbb{R}^n$ span $\mathbb{R}^n$ or not
- Sec 3.3
  - Linear dependence/independence in $\mathbb{R}^n$ and P_n
  - Using determinant to check whether n vectors $v_1, \cdots, v_n$ in $\mathbb{R}^n$ are linearly independent or not
- Sec 3.4
  - Basis and dimension of $\mathbb{R}^n$ and P_n
  - Basis and dimension of subspaces of $\mathbb{R}^n$ and P_n
- Sec 3.5
  - Transition matrix from one basis to another in $\mathbb{R}^n$
  - Changing coordinates using transition matrix in $\mathbb{R}^n$
- Sec 3.6
  - Definition of the rank and the nullity of an $m \times n$ matrix
  - The Rank-Nullity Theorem
- Sec 6.1
  - Definition of eigenvalues and eigenvectors
  - Finding eigenvalues, eigenvectors and eigenspaces of 2×2 and 3×3 matrices
  - The product and sum of eigenvalues and their relation to determinants and traces
- Sec 6.3
  - Diagonalization using eigenvalues and eigenvectors for 2×2 and 3×3 matrices
  - Computing the power of a matrix using diagonalization
- Sec 4.1
  - Linear transformation from $\mathbb{R}^n$ to $\mathbb{R}^m$
  - Linear transformation from P_n to P_m
  - Kernel and range of a linear transformation from $\mathbb{R}^n$ to $\mathbb{R}^m$
- Sec 4.2
  - Matrix representation of a linear transformation from $\mathbb{R}^n$ to $\mathbb{R}^m$