Linear Algebra Standards

Module E: How can we solve systems of linear equations?

- ☐ ☐ **E1. Systems as matrices.** I can translate back and forth between a system of linear equations and the corresponding augmented matrix.
- ☐ ☐ **E2. Row reduction.** I can put a matrix in reduced row echelon form.
- ☐ ☐ **E3. Systems of linear equations.** I can compute the solution set for a system of linear equations.

Module V: What is a vector space?

- ☐ ☐ **V1. Vector spaces.** I can explain why a given set with defined addition and scalar multiplication does satisfy a given vector space property, but nonetheless isn't a vector space.
- ☐ ☐ **V2. Linear combinations.** I can determine if a Euclidean vector can be written as a linear combination of a given set of Euclidean vectors.
- ☐ ☐ **V3. Spanning sets.** I can determine if a set of Euclidean vectors spans $\mathbb{R}^n$.
- ☐ ☐ **V4. Subspaces.** I can determine if a subset of $\mathbb{R}^n$ is a subspace or not.
- ☐ ☐ **V5. Linear independence.** I can determine if a set of Euclidean vectors is linearly dependent or independent.
- ☐ ☐ **V6. Basis verification.** I can determine if a set of Euclidean vectors is a basis of $\mathbb{R}^n$.
- ☐ ☐ **V7. Basis computation.** I can compute a basis for the subspace spanned by a given set of Euclidean vectors.
- ☐ ☐ **V8. Dimension.** I can compute the dimension of a subspace of $\mathbb{R}^n$.
- ☐ ☐ **V9. Abstract vector spaces.** I can compute a basis for the subspace spanned by a given set of polynomials or matrices.
- ☐ ☐ **V10. Basis of solution space.** I can find a basis for the solution set of a homogeneous system of equations.

Module A: How can we understand linear maps algebraically?

- ☐ ☐ **A1. Linear map verification.** I can determine if a map between vector spaces of polynomials is linear or not.
- ☐ ☐ **A2. Linear maps and matrices.** I can translate back and forth between a linear transformation of Euclidean spaces and its standard matrix, and perform related computations.
- ☐ ☐ **A3. Injectivity and surjectivity.** I can determine if a given linear map is injective and/or surjective.
- ☐ ☐ **A4. Kernel and Image.** I can compute a basis for the kernel and a basis for the image of a linear map.

Module M: What algebraic structure do matrices have?

- ☐ ☐ **M1. Matrix Multiplication.** I can multiply matrices.
- ☐ ☐ **M2. Invertible Matrices.** I can determine if a square matrix is invertible or not.
- ☐ ☐ **M3. Matrix inverses.** I can compute the inverse matrix of an invertible matrix.
- ☐ ☐ **M4. Row operations as multiplication.** I can describe the row reduction of a matrix as matrix multiplication.

Module G: How can we understand linear maps geometrically?

- ☐ ☐ **G1. Row operations.** I can describe how a row operation affects the determinant of a matrix.
- ☐ ☐ **G2. Determinants.** I can compute the determinant of a 4×4 matrix.
- ☐ ☐ **G3. Eigenvalues.** I can find the eigenvalues of a 2×2 matrix.
- ☐ ☐ **G4. Eigenvectors.** I can find a basis for the eigenspace of a 4×4 matrix associated with a given eigenvalue.