

# Topics for Midterm

MATH 152, SPRING 2018

DUE WEEK 5 AND 6

1. Vector and Matrix Review:
  - (a) Matrix-vector and matrix-matrix multiplication.
  - (b) Range, column space, nullspace, rank.
  - (c) Linear independence/dependence.
  - (d) Bases.
  - (e) Matrix Inverses.
2. Inner Product
3. Norms (vector and matrix)
4. Orthogonal vectors/orthogonal matrices.
5. Projectors and complementary projectors
  - (a) Orthogonal projectors.
  - (b) Projection with an orthonormal basis and with an arbitrary basis.
6. Positive definite matrices
7. Eigenvalues, eigenvectors (make sure you know how to find these of  $2 \times 2$  and  $3 \times 3$  matrices)
8. PCA:
  - (a) mean values
  - (b) variances, covariance matrices.
  - (c) find eigenvalues and eigenvectors from covariance matrices
  - (d) Project onto principal eigenvectors (Make sure you know the motivation!)