

Linear Algebra Assignment #4

Deadline: April 24, 2019

- 1) [Orthogonality] Let $a=(1,1,1)$ and $b=(-1,1,0)$.
 - a) Determine whether vectors a , and b are orthogonal.
 - b) Find a basis for the orthogonal complement of $\text{Span}\{a,b\}$.
 - c) Find the lengths of vectors a and b and find the cosine angle between them.
 - d) Determine whether vectors a , and b are linearly independent.
- 2) [Projection] Find the projection matrix P that projects every vector b in \mathbb{R}^3 onto the line in the direction of $a = (2, 1, 2)$. Find the column space and the nullspace of P and write a basis for that spaces.
- 3) [Least Squares] Find the curve $y = C + D x^2$ which gives the best least squares fit to the points $(x, y) = (0, 1), (1, 4), (2, 9)$.
- 4) [Gram - Schmidt Process] Find the decomposition of the matrix A into a product of an orthogonal matrix and an upper triangular matrix, using Gram - Schmidt Process.

$$A = \begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix}$$