MATH 2418: Linear Algebra

Assignment#9

Due :<u>10/31, Tuesday, 11:59pm</u>   Term <u>:Fall 2023</u>

[Last Name]	[First Name]	[Net ID]	[Lab Section]

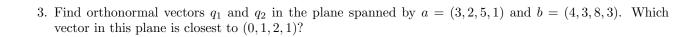**Recommended Problems:**(Do not turn in)
Sec 4.3: 1, 2, 3, 4, 5, 6, 10, 17, 18, 21, 22, 23
Sec 4.4: 1, 2, 3, 4, 5, 6, 7, 17, 18, 21, 22, 24.

1. Find the values of C and D so that the straight line $b = C + Dt$ gives the least squares approximation to the data below. Calculate the predicted values $\hat{b}$ which lie on the resulting least squares regression line.

t	0	1	2	3
b	2	1	-1	2
$\hat{b}$				

2. Find the best parabola to fit the data points: $(-2, 2), (0, 1), (1, 1), (2, 3)$.

3. Find orthonormal vectors q_1 and q_2 in the plane spanned by $a = (3, 2, 5, 1)$ and $b = (4, 3, 8, 3)$. Which vector in this plane is closest to $(0, 1, 2, 1)$?

4. Find orthonormal vectors q_1, q_2, and q_3 such that q_1 and q_2 span the column space of the matrix

$$A = \begin{bmatrix} 1 & 2 \\ 2 & -3 \\ -2 & 4 \end{bmatrix}.$$

Which of the four fundamental subspaces contains q_3?

Solve $A\mathbf{x} = \mathbf{b}$, where $\mathbf{b} = (1, 2, 4)^T$ by least squares.

5. Find orthonormal vectors q_1, q_2, and q_3 as combinations of the columns of matrix A, where

$$A = \begin{bmatrix} 2 & 2 & 4 \\ 0 & 0 & 3 \\ 0 & 3 & 6 \end{bmatrix}.$$

Then write A as QR.

6. Find a basis for the subspace $\mathbf{S}$ in $\mathbf{R}^4$ spanned by all solutions of

$$x_1 + 2x_2 + 3x_3 - x_4 = 0.$$

Find a basis for the orthogonal complement of S. Find b_1 in S and b_2 in the orthogonal complement of S so that $b_1 + b_2 = b = (1, 1, 2, 4)$.