name: Mosab Mohamed group: B20-04 Variant: 2

Q1. ans: Yes, they are linearly independent

because: none of them can be defined as a linear combination of the other two

Q2. ans: $P = [0,-2,1]^T \quad q = [2,-1,0]^T$

Parallel Projection $= \frac{q \cdot P}{\|q\|^2} q = \frac{2}{5} q = [\frac{4}{5}, \frac{-2}{5}, 0]^T$

length of Parallel $= \sqrt{v \cdot v} = \sqrt{\frac{4}{5}}$

length of perpendicular $= \sqrt{\quad} = \sqrt{\frac{9}{5}}$

perpendicular projection $= q - \text{Parallel} = [2,-1,0]^T - [\frac{4}{5}, \frac{-2}{5}, 0]^T = [\frac{6}{5}, -\frac{3}{5}, 0]^T$

Q3. ans: $A = \begin{bmatrix} 5 & -2 \\ 9 & 1 \end{bmatrix}$

$A^{-1} = \frac{1}{ad-bc} \begin{bmatrix} 1 & 2 \\ -9 & 5 \end{bmatrix}$

$A^{-1} = \frac{1}{23} \begin{bmatrix} 1 & 2 \\ -9 & 5 \end{bmatrix}$

$A^{-1} = \begin{bmatrix} \frac{1}{23} & \frac{2}{23} \\ \frac{-9}{23} & \frac{5}{23} \end{bmatrix}$

$B = \begin{bmatrix} 2 & 6 & -6 \\ 2 & -3 & -1 \\ 3 & 0 & -4 \end{bmatrix}$

minors $= \begin{bmatrix} 12 & 5 & 9 \\ -24 & 10 & -18 \\ -24 & 10 & -18 \end{bmatrix}$

cofactors: $\begin{bmatrix} 12 & -5 & -9 \\ 24 & 10 & 18 \\ -24 & -10 & -18 \end{bmatrix}$

transpose: $\begin{bmatrix} 12 & 24 & -24 \\ -5 & 10 & -10 \\ -9 & 18 & -18 \end{bmatrix}$

$\det = 2(12-0) - 6(-8+3) + (-6)(0+9) = 24 + 30 - 54 = 0$

ans: the inverse doesn't exist because the determinant is zero and we can't divide by zero