1. Let \( A = \begin{bmatrix} 1 & 1 \\ 2 & 4 \\ 4 & 16 \\ 5 & 25 \end{bmatrix} \) and \( y = \begin{bmatrix} 13 \\ -12 \\ -5 \\ 21 \end{bmatrix} \). It’s a fact that \( y \) is not in \( \text{Col}(A) \); you do \textbf{not} need to verify this.

1A. Find the least-squares solution of \( Ax = y \). Show any and all matrices you used.

1B. Find the projection vector \( \mathbf{p} \) of \( y \) onto the column space of \( A \).

1C. Find the vector \( \mathbf{z} \) satisfying \( \mathbf{p} + \mathbf{z} = y \).

1D. Find the distance from \( y \) to \( \text{Col}(A) \).

1E. Verify that \( \mathbf{z} \) is in \( \text{Col}(A)^\perp \) by calculating the two appropriate dot products.

1F. The work done in this problem would be appropriate for solving which problem: (put a check next to the correct one)

Find the best fit curve of the form \( y = \beta_1 x + \beta_2 x^2 \) through the points \((1, 1), (2, 4), (4, 16)\) and \((5, 25)\).

Find the best fit curve of the form \( y = \beta_0 + \beta_1 x^2 \) through the points \((1, 13), (2, -12), (4, -5)\) and \((5, 21)\).

Find the best fit curve of the form \( y = \beta_1 x + \beta_2 x^2 \) through the points \((1, 13), (2, -12), (4, -5)\) and \((5, 21)\).

Find the best fit curve of the form \( y = \beta_0 + \beta_1 x + \beta_2 x^2 \) through the points \((1, 13), (2, -12), (4, 16, -5)\) and \((5, 25, 21)\).