Proficiency Exam 7 - Least Squares and SVD

You will have 30 minutes to complete the exam. You may use a calculator, but you must show all steps done to get full credit for completing the problem. This means that if you use your calculator for anything other than arithmetic, you must indicate on your test paper what you did on the calculator.

1. Find the line of best fit through the points (3,0), (1,4), (-1,6), (0,7).

2. Compute the projection of the vector $(1, 2, 3, 4)$ onto the subspace spanned by the vectors

$$\begin{bmatrix} -3 \\ 1 \\ 4 \\ 2 \end{bmatrix}, \begin{bmatrix} 0 \\ 2 \\ 0 \\ 7 \end{bmatrix}.$$

3. (TRUE or FALSE) Consider the statement and decide if it is true or false. If true, provide reasoning. If false, provide a counterexample.

   " Suppose that Q and R are orthogonal matrices, then QR is also an orthogonal matrix. "

4. Compute the singular values of the matrix

$$\begin{bmatrix} 1 & -1 \\ 0 & 2 \\ 3 & -7 \\ -1 & 5 \end{bmatrix}.$$