

hw6b , **due on iLearn by 12:30pm on Tuesday, May 3**

1. Find the singular values of the matrix $\begin{bmatrix} -5 & 0 \\ 0 & 0 \end{bmatrix}$.
2. Suppose the factorization below is an SVD of a matrix A , with the entries in U and V rounded to two decimal places.

$$A = \begin{bmatrix} -0.86 & -0.11 & -0.50 \\ 0.31 & 0.68 & -0.67 \\ 0.41 & -0.73 & -0.55 \end{bmatrix} \begin{bmatrix} 12.48 & 0 & 0 & 0 \\ 0 & 6.34 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix} \begin{bmatrix} 0.66 & -0.03 & -0.35 & 0.66 \\ -0.13 & -0.90 & -0.39 & -0.13 \\ 0.65 & 0.08 & -0.16 & -0.73 \\ -0.34 & 0.42 & -0.84 & -0.08 \end{bmatrix}$$

- (a) What is the rank of A ?
 - (b) Use this decomposition of A , with no calculations, to write a basis for $\text{Col } A$ and a basis for $\text{Nul } A$.
3. Suppose A is square and invertible. Find a singular value decomposition of A^{-1} .
 4. Show that if A is square, then $|\det A|$ is the product of the singular values of A .
 5. Find the *minimal length* least-squares solution of the equation $A\mathbf{x} = \mathbf{b}$, where

$$A = \begin{bmatrix} 1 & 1 & 0 \\ 1 & 1 & 0 \\ 1 & 0 & 1 \\ 1 & 0 & 1 \end{bmatrix}, \quad \mathbf{b} = \begin{bmatrix} 1 \\ 3 \\ 8 \\ 2 \end{bmatrix}.$$