## Exercises on singular value decomposition

**Problem 29.1:** (Based on 6.7 #4. *Introduction to Linear Algebra:* Strang) Verify that if we compute the singular value decomposition  $A = U\Sigma V^T$  of the Fibonacci matrix  $A = \begin{bmatrix} 1 & 1 \\ 1 & 0 \end{bmatrix}$ ,

$$\Sigma = \left[ egin{array}{cc} rac{1+\sqrt{5}}{2} & 0 \ 0 & rac{\sqrt{5}-1}{2} \end{array} 
ight].$$

**Problem 29.2:** (6.7 #11.) Suppose *A* has orthogonal columns  $\mathbf{w}_1$ ,  $\mathbf{w}_2$ , ...,  $\mathbf{w}_n$  of lengths  $\sigma_1$ ,  $\sigma_2$ , ...,  $\sigma_n$ . Calculate  $A^TA$ . What are U,  $\Sigma$ , and V in the SVD?

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