

**Homework 4. Due Thursday Nov. 4.**

1. **(10 pts)** Prove the Eckart-Young-Mirsky theorem for any Ky-Fan norm, i.e., if  $A = U\Sigma V^\top$  is the SVD of  $A$ , and  $M$  is any matrix of the size of  $A$  such that  $\text{rank}(M) \leq k$ , then

$$\|A - M\| \geq \|A - U_k \Sigma_k V_k^\top\| \quad \text{for any Ky-Fan norm } \|\cdot\|.$$

*Hint: You might find helpful the paper by A. Dax “From Eigenvalues to Singular Values: A Review”.*