Charles Zheng EE 378b HW 3

1. a. Since the space of unit vectors is compact, there exists x^* such that $||M||_2 = ||Mx^*||_2$. Also, there exist unit vectors x°, y° such that

$$\langle x^\circ, My^\circ \rangle = \max_{||x||=||y||=1} \langle x, My \rangle$$

Letting $y^* = Mx^*/||M||_2$, we have $||y||_2 = 1$. Therefore

$$||M||_2 = y^* M x^* \leq \max_{||y||=||x||=1} \langle y, Mx \rangle$$

2.

3.

4.

5.