$$\arg\max_{\|z\|_\infty \le 1} z^T x = \sum_i z_i x_i \Rightarrow z_i = \begin{cases} \text{sign}(x_i) & x_i \neq 0 \\ [-1,1] & x_i = 0 \end{cases}$$

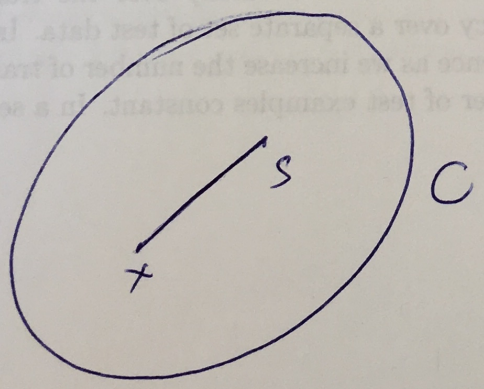
$$\sum_i |x_i| = \|x\|_1$$

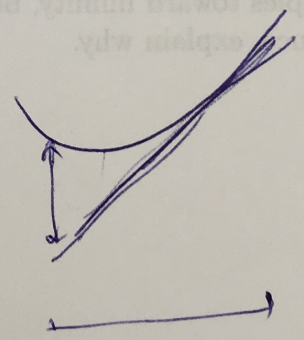
$$\partial \|x\|_\infty = \arg\max_{\|z\|_1 \le 1} z^T x \Rightarrow z_i = \begin{cases} \text{sign}(x_i) & i : x_i = \|x\|_\infty \\ 0 & \text{o.w.} \end{cases}$$

$$z = \text{sign}(x_{i_{max}})\, e_{i_{max}}$$

$$\partial \|X\|_{op} = \arg\max_{\|Z\|_{tr} \le 1} \text{tr}(Z^T X) \qquad X = \sum_i \lambda_{(i)} u_{(i)} v_{(i)}^T$$

$$Z = u_{(1)} v_{(1)}^T$$





$$M \le \max_{x,s \in C} \frac{2}{r^2} \frac{L}{2} \underbrace{\|y - x\|^2}_{H}$$

$$y = (1-r)x + rs$$

$$\|(1-r)x + rs - x\|^2 = r^2 \|x - s\|^2$$