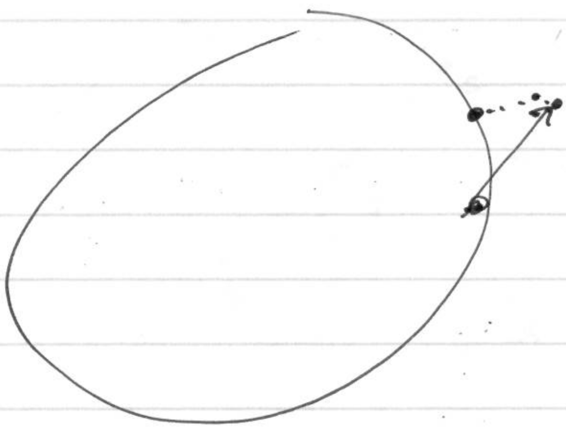
safe screening rule : if it passes, then we are guaranteed to have a 0 coefficient at solution

non-safe rules : may know that w.h.p. have a 0 coefficient at solution

OR

coefficient is small at sol.
(means it has little statistical effect)

SURE
strong



$$\|x\|_* = \max_{\|z\|\le 1} x^T z \qquad \text{dual norm}$$

$$\partial \|x\|_* = \operatorname{argmax}_{\|z\|\le 1} x^T z \qquad \text{subgradients.}$$

$$\|tz\| = t\|z\|$$

if have $\|x\|_\infty = |x_i|$ (i^{th} comp achieved the max)

then $\text{sign}(x_i)\cdot e_i \in \partial\|x\|_\infty$

$e_i = (0, \ldots 1, \ldots 0)$, 1 in the i^{th} spot

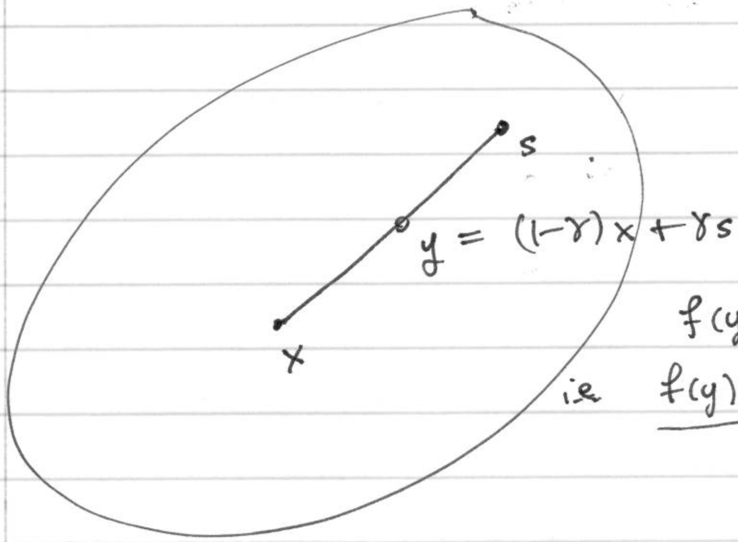
$$f(s) \geq f(x^{(k-1)}) + \nabla f^T (s - x^{(k-1)})$$

min over $s \in C$:

$$f^* \geq f(x^{(k-1)}) + \min_{s \in C} \nabla f^T (s - x^{(k-1)})$$

rearrange :

$$- \min_{s \in C} \nabla f^T (s - x^{(k-1)}) \geq f(x^{(k-1)}) - f^*$$



$$f(y) \geq f(x) + \nabla f(x)^T (y - x)$$

ie $\underline{f(y) - f(x) - \nabla f(x)^T (y-x) \geq 0.}$