

Comments on CSE 383C HW/workthroughs

1.  $\kappa = \text{cond}_2(A)$  can be computed using the following formula:

$\|e_j\|_A = 10^{-D} \|e_0\|_A$ , where  $10^{-D}$  is the prescribed relative error ( $D$  is known).

$$\|e_j\|_A = 10^{-D} \|e_0\|_A = \|e_0\|_A \left(\frac{\kappa-1}{\kappa+1}\right)^j \Rightarrow 10^{-D} = \left(\frac{\kappa-1}{\kappa+1}\right)^j$$

$$\Rightarrow -D = j(\log(\kappa-1) - \log(\kappa+1))$$

taylor expand  $\Rightarrow -D = -\frac{2j}{\kappa} \rightarrow j = \frac{\kappa D}{2}$

$$\Rightarrow \boxed{\kappa = \frac{2j}{D}}$$

Thus, run CG, record # iterations ( $j$ ) it takes to converge, and using  $D$ , known integer representing desired relative error, we can roughly guess the ~~cond~~ 2-norm condition number for  $A$  SPD.

(turn this in)