

## Final Observation

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- When I used  $\text{norm}(r) > \text{eps} * (b)$  as the stopping criteria, iterations ended quite quickly. However, when I used my own criteria ( $\text{any}(\text{abs}(r) \geq 1e-24)$ ), niters was around 10,000. In contrast, using incomplete Cholesky factorization with  $\text{droptol} = 1e-4$ , the process was done in less than twenty (c.f. the given  $\text{droptol}$  of  $1e-2$  did not help). Finally, when I dropped the tolerance to  $1e-10$ , the process was done in merely two iterations.
- As for the conjugate method, my code completed the calculation in 19 iterations. Using preconditioned CG with incomplete Cholesky factorization of  $\text{droptol}$  at  $1e-4$ , 11 iterations were enough. With the  $\text{droptol}$  of  $1e-10$ , the process was done in only two iterations.
- My observation is that although the total iterations may matter, the number of calculations in each iteration should also be considered. It looks like preconditioned versions did not save much time in the exam's case because they had to calculate triangular solves and used more time per iteration.