

## CSUMS Seminar Three – Wednesday, October 1, 2008

### Computer Tasks

With your partner, please write an  $m$ -file called `steepest.m` that takes an input  $n \times n$  matrix  $\mathbf{A}$ ,  $n$ -vectors  $\mathbf{b}$ ,  $\mathbf{x}_0$  (initial guess) and  $\mathbf{v} \neq \mathbf{0}$  (initial direction), a maximum number of iterations `maxits`, and a tolerance `eps`, and returns an approximation  $\mathbf{x}^*$  to the system  $\mathbf{Ax} = \mathbf{b}$  such that  $\|\mathbf{x}^{(k)} - \mathbf{x}^*\|_2 < \epsilon$ . If `maxits` is exceeded, the routine should return an error message to that effect.

Write a script file called `steepesttest.m` that uses `maxits = 50` and `eps = .000001` to approximate solutions to  $\mathbf{Ax} = \mathbf{b}$  where

$$(a) \quad \mathbf{A} = \begin{bmatrix} 3 & -1 & 1 \\ -1 & 6 & 2 \\ 1 & 2 & 7 \end{bmatrix} \text{ and } \mathbf{b} = [1 \ 0 \ 4]^T. \text{ Use } \mathbf{x}^0 = \mathbf{0} \text{ and } \mathbf{v} = [1 \ 0 \ 0]^T.$$

$$(b) \quad \mathbf{A} = \begin{bmatrix} 4 & 1 & -1 & 1 \\ 1 & 4 & -1 & -1 \\ -1 & -1 & 5 & 1 \\ 1 & -1 & 1 & 3 \end{bmatrix} \text{ and } \mathbf{b} = [-2 \ -1 \ 0 \ 1]^T. \text{ Use } \mathbf{x}^0 = \mathbf{0} \text{ and } \mathbf{v} = [1 \ 0 \ 0 \ 0]^T.$$

### Reading Tasks

Read Sections 6, 7 and 8 of the Shewchuk paper linked under the Week One Seminar.

### To Turn In:

Email your two matlab files to Professors Stolarska and Van Fleet (`mastolarska`, `pjvanfleet`) on or before noon on Tuesday, October 7, 2008.