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Name \_\_\_\_\_

Section H J

Subsection left center right

Row number 1 2 3 4 5 6 7 8

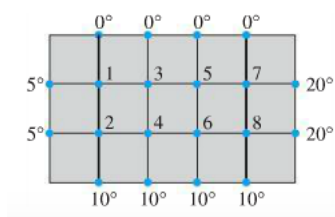
# Mathematics 1553

Written Homework 5

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- Say we want to find the temperatures at the interior points in this grid:



As in problem 7 on WebWork assignment 1.1, we do this by solving  $Ax = b$  where

$$A = \begin{pmatrix} 4 & -1 & -1 & 0 & 0 & 0 & 0 & 0 \\ -1 & 4 & 0 & -1 & 0 & 0 & 0 & 0 \\ -1 & 0 & 4 & -1 & -1 & 0 & 0 & 0 \\ 0 & -1 & -1 & 4 & 0 & -1 & 0 & 0 \\ 0 & 0 & -1 & 0 & 4 & -1 & -1 & 0 \\ 0 & 0 & 0 & -1 & -1 & 4 & 0 & -1 \\ 0 & 0 & 0 & 0 & -1 & 0 & 4 & -1 \\ 0 & 0 & 0 & 0 & 0 & -1 & -1 & 4 \end{pmatrix}$$

and  $b = (5, 15, 0, 10, 0, 10, 20, 30)$ . We say that  $A$  is a band matrix because all of the nonzero entries are near the diagonal. Find an LU decomposition of  $A$ .

Use your LU factorization to solve  $Ax = b$ .

Use a computer program to find  $A^{-1}$ , for instance: <http://www.bluebit.gr/matrix-calculator/>

If  $A$  was a  $100 \times 100$  band matrix, which do you think would take less computer memory to store,  $A^{-1}$  or  $L$  and  $U$ ?