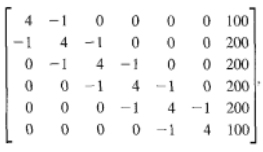
2(a)

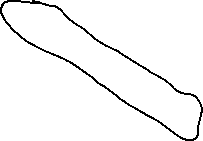
Since the matrix is symmetric, we can only use three columns for each equation, one for b and the other two for A (4, -1). To solve this equation, we just need to use simple Gaussian elimination. For each row, we have to use A[i+1][i] / A[i][i] for gaussian elimination to eliminate the (-1) and update b[i+1], A[i+1][i+1]. The information we need is enough to store in a n\*3 matrix.

After finishing gaussian elimination, we use back substitution to get all the answers.

(b) Implementation

一張含有 文字, 螢幕擷取畫面, 軟體, 字型 的圖片

AI 產生的內容可能不正確。



Matrix A stores all the entries I circle in the above picture. Since the matric is symmetric, the value in constructed matrix A[0][1] store both the value in red circle and A[1~n-1][1] store the value in the same way. A[0~n-1][0] store all the diagonal value. In this way, we can store all the matrix in this form into n\*3 matrix without losing the information.

We can use the compact form matric to carefully processing the gaussian elimination and use back substitution for all the answer.

(c)

For each row (0 ~ n-2), when implementing Gaussian elimination, we need to compute the ratio for next row, then one value in A and one value in B need to multiply that ratio and minus to the next row. Therefore, we need 5(n-1) for this step. For each row(0~n-1), when implementing back substitution, we need to multiply one entry in A and minus it to B and finally do a division. Therefore, we need another 3\*n for this step, but the bottom row doesn’t need multiplication and subtraction.

Therefore, total arithmetic operations = 5n-5+3\*n-2 = 8\*n-7