

1 /* Math/CS 466/666 Midterm Solutions

Problem 1(iii). Write or modify a computer program to compute the Frobenius norm

$$\|A\|_F = \sqrt{\sum_{i,j} |A_{ij}|^2}$$

of the 4×4 matrix A with entries given by the formula $A_{ij} = \sqrt{i + 2j}$. */

```

10
11 #include <stdio.h>
12 #include <math.h>
13
14 double normF(int n, double A[n][n]){
15     double r=0;
16     for(int i=0; i<n; i++) for(int j=0; j<n; j++){
17         r+=A[i][j]*A[i][j];
18     }
19     return sqrt(r);
20 }
21 void matprint(int n, double A[n][n]){
22     for(int i=0; i<n; i++) for(int j=0; j<n; j++){
23         printf("%8g%c", A[i][j], j==n-1?'\n':' ');
24     }
25 }
26
27 #define N 4
28 double A[N][N];
29
30 int main(){
31     printf("Math/CS 466/666 Midterm\nProblem 1(iii)\n\n");
32     for(int i=1; i<=N; i++) for(int j=1; j<=N; j++){
33         /* Mathematical notation assumes  $i$  and  $j$  range from 1 to  $N$ . As C arrays
34            always start at zero we store the matrix as  $A_{ij} = A[i-1][j-1]$  */
35         A[i-1][j-1]=sqrt(i+2*j);
36     }
37     printf("A=\n");
38     matprint(N,A);
39     printf("\nnormF(A)=%.14e\n", normF(N,A));
40     return 0;
41 }
42 }

```