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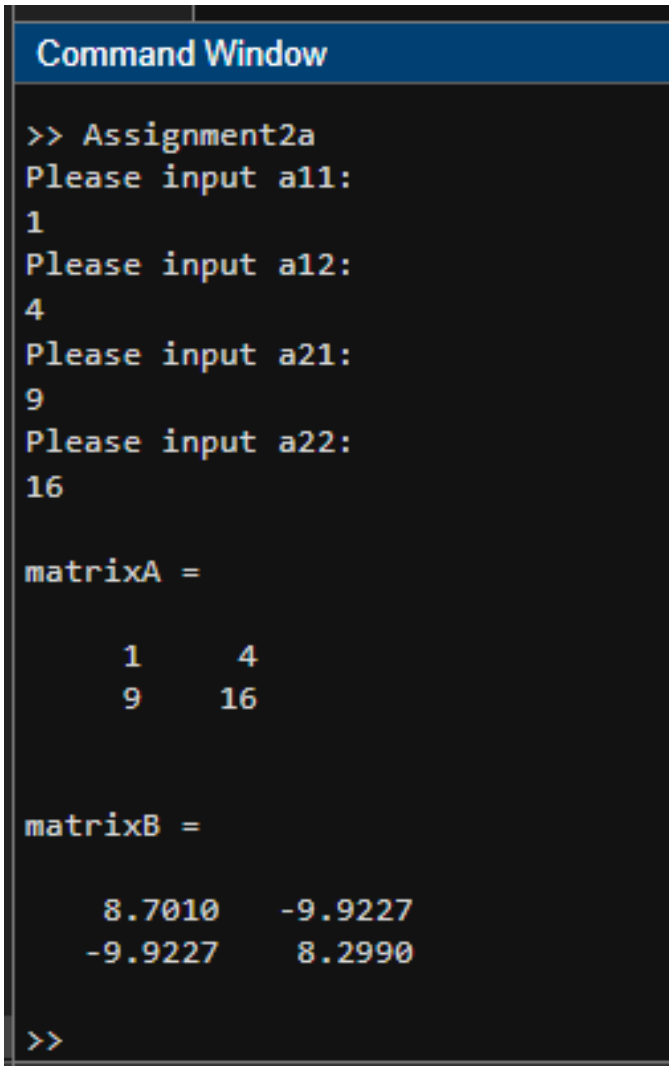
CSE 5350 - Numerical Computation
Assignment #2

(a)

Matlab Code:

```
a11 = input('Please input a11:');
a12 = input('Please input a12:');
a21 = input('Please input a21:');
a22 = input('Please input a22:');

matrixA = [a11 a12; a21 a22]
matrixB = symmetrize2x2matrix(matrixA)

function matrixB = symmetrize2x2matrix(matrixA)
a12 = matrixA(1, 2);
a21 = matrixA(2, 1);
normOfDiagnal = sqrt(a12^2 + a21^2);
if normOfDiagnal == 0
   matrixB = matrixA;
   return
end

c = a12 / normOfDiagnal;
s = a21 / normOfDiagnal;
theta = atan2(s, c);

matrixD = [cos(theta), -sin(theta); sin(theta), cos(theta)];
matrixA = matrixD * matrixA * matrixD';
matrixB = (matrixA + matrixA') / 2;
end
```

Terminal:

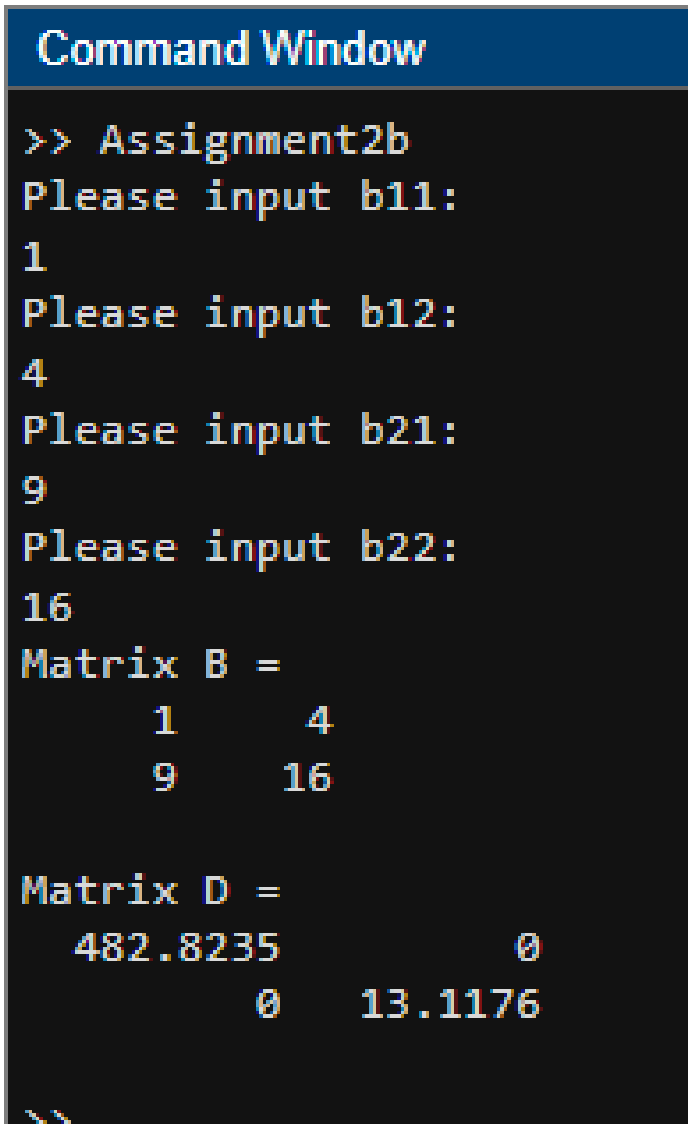

Command Window
>> Assignment2a
Please input a11:
1
Please input a12:
4
Please input a21:
9
Please input a22:
16
matrixA =
1 4
9 16
matrixB =
8.7010 -9.9227
-9.9227 8.2990
>>

(b)

Matlab Code:

```
b11 = input('Please input b11:');
b12 = input('Please input b12:');
b21 = input('Please input b21:');
b22 = input('Please input b22:');

matrixB = [b11 b12; b21 b22];
matrixD = diagonalize_matrix(matrixB);

disp("Matrix B =")
disp(matrixB)
disp("Matrix D =")
disp(matrixD)

function matrixD = diagonalize_matrix(matrixB)
b12 = matrixB(1, 2);
if b12 == 0
   matrixD = matrixB;
   return;
end

dl = (matrixB(1,1) - matrixB(2, 2)) /2;
sn = sign(dl);
if sn == 0
  sn = 1;
end

rsm = matrixB(1, 2) / (dl + sn * sqrt(dl^2 + matrixB(1, 2)^2));
c = 1 / sqrt(1 + rsm^2);
s = rsm * c;
matrixD = [matrixB(1, 1) * c^2 - 2 * matrixB(1,2) * c * s * + matrixB(2, 2)^2,
0; 0, matrixB(2, 2) * c^2 + 2 * matrixB(1, 2) * c * s - matrixB(1, 1) * s^2];
end
```

Terminal:


Command Window
>> Assignment2b
Please input b11:
1
Please input b12:
4
Please input b21:
9
Please input b22:
16
Matrix B =
1 4
9 16
Matrix D =
482.8235 0
0 13.1176
>>