

University of Massachusetts, Amherst
Department of Civil & Environmental Engineering
CEE 630: Advanced Solid Mechanics (Fall 2006)

Solving eigenvalue problems using Mathcad or Matlab

1 Mathcad

Follow this procedure to find the eigenvalues and eigenvectors in Mathcad. If you need help as you go along, try searching the Mathcad help files for the words 'array' and 'eigenvalue'.

1. Open Mathcad, produced by Mathsoft
2. If one did not automatically appear, open a new, blank, worksheet
3. Click on a blank spot on the worksheet to make a red cursor appear
4. type: $m:=$
5. from the 'insert' menu, choose 'matrix'
6. specify the number of rows and columns needed (3 x 3) for a 3D stress matrix
7. A matrix should appear on the worksheet, fill in the desired values
8. Somewhere below the definition of the matrix, click again to make a new cursor appear
9. type 'eigenvals(m) =' and hit return, this should report the eigenvalues of the matrix
10. Click below the above command to give a new cursor
11. type 'eigenvecs(m) =' and hit return. This should give the eigenvectors as columns of a matrix.

2 Matlab

Follow this procedure to find the eigenvalues and eigenvectors of matrix in Matlab. If you need further help type 'help eigs' at the Matlab command prompt.

1. Open matlab and click on the command window so that you get a blinking cursor next to a ' \gg ' symbol. This is the command prompt.

2. Define a matrix variable by enclosing the matrix in square brackets, separating entries on a row by commas, and rows by semicolons. For example, to define the matrix

$$\begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \\ 3 & 4 & 5 \end{bmatrix}$$

, type 'm = [1,2,3;2,3,4;3,4,5]' You will see the matrix appear on the screen.

3. to find the eigenvalues and eigenvectors type '[v,d] = eigs(m)' The diagonal entries of 'd' are the eigenvalues, and the columns of 'v' are the eigenvectors.