

Programming assignment #1

Write a MATLAB function that generate the **nodal coordinates** and **connectivity matrix** for a 1D finite element mesh made up of two-node elements as shown in Figure 1 below.

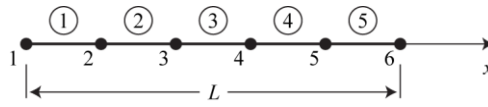


Figure 1. Node and element numbering for a 1D finite element mesh.

Instructions for programming and assignment submission:

- Submit a single file (MATLAB code). The file name must be in the format “asurite_hw1.m”. Note that the separator is an underscore and you must substitute your ASU login. For example: “asurite” → “jdoe123”.
- The file **must** define a function of the same name as the file name (but without the “.m”) , e.g.,

```
function [node_coords, connectivity] = asurite_hw1(ne, L)
    % Code goes here to define nodes & connectivity.
end
```

- Make sure you also replace “asurite” in the function name with your ASU login.
- L is the total length of the domain, and ne is the number of elements.
- The function must return two variables. The first must be a $1 \times nn$ matrix of nodal coordinates (where nn is the total number of nodes). The second must be a $2 \times ne$ matrix, where each column contains the nodes contained in the corresponding element. For example, given inputs $L = 12$ and $ne = 5$, and the correct outputs would be:

$$\text{node_coords} = [0 \quad 2.4 \quad 4.8 \quad 7.2 \quad 9.6 \quad 12], \quad \text{and} \quad \text{connectivity} = \begin{bmatrix} 1 & 2 & 3 & 4 & 5 \\ 2 & 3 & 4 & 5 & 6 \end{bmatrix},$$

where, e.g., the first column of connectivity is [1;2] which are the nodes contained in element 1.

- Nodes and elements must be ordered left-to-right and sequentially as shown in Figure 1 and the location of node 1 must be located at $x = 0$.
- Your code must give the correct outputs for any reasonable values of ne and L. If your code only works for one specific case, you will get zero credit.