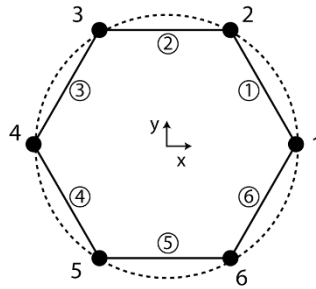


MAE 404/598 Finite Elements in Engineering

Programming assignment #1

Write a MATLAB function that generate the **nodal coordinates** and **connectivity matrix** for a 1D finite element mesh approximating a circle.



In the example pictured above, the mesh has 6 nodes and 6 line elements and the circle has a radius of $r = 1$. In this specific case, the correct output would be

nodes =	1.0000	0.5000	-0.5000	-1.0000	-0.5000	0.5000
	0	0.8660	0.8660	0.0000	-0.8660	-0.8660
connectivity =	1	2	3	4	5	6
	2	3	4	5	6	1

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.
- The file must define a function of the same name as the file name (but without the “.m”) , e.g.

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

- N is the number of nodes and R is the radius of the circle. Nodes must be equally spaced.
- The function must return two variables, the first must be a $2 \times N$ matrix of nodal coordinates. The second must be a $2 \times N$ matrix, where each column gives the nodes present in the corresponding element.
- Nodes and elements should be ordered counterclockwise, with the first node located at $(x, y) = (R, 0)$ as shown in Figure 1.
- Your code should work for any reasonable values of N and R. If your code only works for one specific case, you still get zero credit.
- Your code **must** run without any user input (e.g. do not use MATLAB’s *input* function).
- Your solution must be correct to $\pm 0.001\%$ (hint: use MATLAB constant *pi* rather than 3.14).

Your submission will be graded electronically. Failure to comply with the above instructions may result in zero credit.

Submit your assignment to <http://sparky.fulton.asu.edu/fe/>

Can be resubmitted daily until the cutoff date: Jan 19 at 6 pm.

You may submit as many times as you like, however only your most recent submission will count for you grade. Assignments will be graded at 6 pm on a daily basis until the cutoff date.