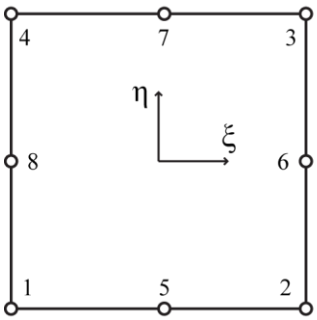
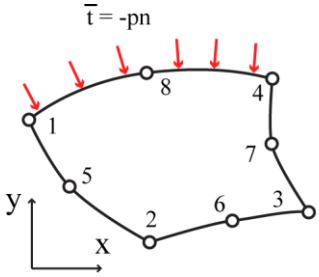
MAE 404/598 Finite Elements in Engineering
Programming assignment #8

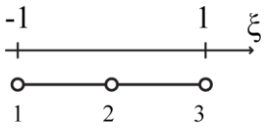
Write a program to integrate the nodal force matrix for an arbitrary 8-node serendipity element. The nodal forces are generated by a constant pressure load on the edge containing nodes [1,8,4].



parent coordinates



arbitrary
global coordinates



edge parent
coordinates

Note that a positive pressure applies a compressive force; i.e. opposite in direction to the outward normal direction.

Hint: you will need to use the Jacobian along the edge $J_\Gamma = \frac{\partial \mathbf{x}}{\partial \xi} = x_I^e \frac{\partial \mathbf{N}_I^e}{\partial \xi}$

Second hint: $\frac{\partial \mathbf{x}}{\partial \xi}$ is not perpendicular to $\frac{\partial \mathbf{x}}{\partial \eta}$

Instructions for programming and assignment submission:

- For this assignment, you will submit only a single file (MATLAB code), with file name **must** be in the format "**asurite_hw8.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 [f] = asurite_hw8(xe, p)
    % Compute the 1x16 nodal force vector here vector here.
end
```

- **Input:** Element nodal coordinates, (xe): 2×8 matrix that gives the coordinates of the eight nodes.
- **Input:** Pressure (p): a scalar value giving the hydrostatic pressure applied on the edge.
- **Output:** Nodal force vector (f) has to be 16x1 with the ordering [f_{1x}, f_{1y}, f_{2x}, f_{2y}, …, f_{8x}, f_{8y}]**.**
- Use a two-point integration rule.

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: Thursday, April 14 at midnight.