Programming assignment #7

Write a MATLAB function that integrates the nodal forces due to a body force using 3-node quadratic elements.

$$\mathbf{f}_\Omega = \sum_e \mathbf{L}^{eT} \mathbf{f}_\Omega^e,$$

$$\text{where } \mathbf{f}_\Omega^e = \int_{-1}^{1} \mathbf{N}^e(\xi) b(x) \frac{dx}{d\xi} d\xi$$

Use the two-point Gaussian quadrature rule to evaluate these integrals numerically within each element.

Instructions for programming and assignment submission:

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```
function [f] = asurite_hw7(mesh, b)
    % Defines default inputs for testing.
    if nargin == 0
        ne = 4;
        nn = 2*ne + 1;
        mesh.x = linspace(-2, 2, nn);
        mesh.conn = [1:2:nn-2; 2:2:nn-1; 3:2:nn];
        b = @(x) exp(-x.^2);
    end
    % Compute nodal force vector.
end
```

- The order of the input variables and output variables must not be changed.
- You may use the quadrature function provided with Project 1.
- **The input variables are:**
    - **mesh:** a structure containing fields mesh.x and mesh.conn that defines a mesh of 3-node quadratic element.
    - **b:** A function that returns the body force at position x.
- **The output variable is:**
    - **f:** the body force vector (must be size n×1, where n is the number of nodes).