Assignment-3 Q1

```
clear
% Disclaimer - I have changed the order of the elements and renamed them in
% anti-clockwise order in order to use the regular convention.

E = 110e+9;
nu = 0.3;
points = [0 3 3 0;-1 -1 1 1];

x_e = points(1,:);
y_e = points(2,:);
% Plane Stress Conditions
D = (E/(1-nu^2))*[1 nu 0;nu 1 0;0 0 (1-nu)/2];

Ae = (points(1,2) - points(1,1))*(points(2,3) - points(2,2));

zeta = [-1/sqrt(3) 1/sqrt(3)];
eta = [-1/sqrt(3) 1/sqrt(3)];

w = [1 1];

x_val = 3*[0.2113 0.7887];

y_val = 2*[0.2113 0.7887]-1;

J_det = 1.5;

K = zeros(8);

for p = 1:2
    for q = 1:2

        x = x_val(p);
        y = y_val(q);

        H = (1/Ae)*[(y - y_e(4)), 0, -(y - y_e(4)), 0 (y - y_e(1)), 0 , -(y -
 y_e(1)), 0;
                    0, (x - x_e(2)), 0, -(x - x_e(1)), 0, (x - x_e(1)), 0, -(x
 - x_e(2));
                    (x - x_e(2)) (y - y_e(4)) -(x - x_e(1)) -(y - y_e(4)) (x -
 x_e(1)) (y - y_e(1)) -(x - x_e(2)) -(y - y_e(1))];

        K_temp = w(p)*w(q)*J_det*transpose(H)*D*H;

        K = K + K_temp;

    end
end

% Value of Element Stiffness Matrix
```

```
K
```

```
K =

   1.0e+10 *

  Columns 1 through 7

    4.8018    1.9643   -1.6287   -0.1511   -2.4006   -1.9643   -0.7725
    1.9643    6.9844    0.1511    2.0815   -1.9643   -3.4918   -0.1511
   -1.6287    0.1511    4.8018   -1.9643   -0.7725   -0.1511   -2.4006
   -0.1511    2.0815   -1.9643    6.9844    0.1511   -5.5742    1.9643
   -2.4006   -1.9643   -0.7725    0.1511    4.8018    1.9643   -1.6287
   -1.9643   -3.4918   -0.1511   -5.5742    1.9643    6.9844    0.1511
   -0.7725   -0.1511   -2.4006    1.9643   -1.6287    0.1511    4.8018
    0.1511   -5.5742    1.9643   -3.4918   -0.1511    2.0815   -1.9643

  Column 8

    0.1511
   -5.5742
    1.9643
   -3.4918
   -0.1511
    2.0815
   -1.9643
    6.9844
```

Published with MATLAB® R2021b