Exercises 5.6

3. The nodal coordinates of a 3-node bar element are (x1,y1) = (−1,−1), (x2,y2) = (1,1) and (x3,y3) = (0,1). If the material unit weight is γ = 70kN/m³ and the section area is A = 0.02m², calculate the equivalentnodal forces due to the element weight. Use numerical integration.

```
clear all
clc
```

```
C = [-1 -1; 1 1; 0 1];
A = 0.02;
gamma = 70;
q = 3;
noelem = size(C, 1);
F = body_forces(C, A, gamma, q, noelem);
vpa(F,3)
```

```
ans =
```

$$\begin{pmatrix} 1.39 \\ 0.424 \\ 2.97 \end{pmatrix}$$

```
function F = body_forces(C, h, gamma, q, NoElem)
q           = quadrature_lin(q);
Npst        = size(q, 1);
nnodes      = size(C, 1);
F           = zeros(nnodes, 1);
for i       = 1:Npst
    xi      = q (i, 1);
    w       = q (i, 2);
    [dN, N] = lin_shape_form(NoElem, xi);
    J       = C'*dN;
    F       = F + N*gamma*h*norm(J)*w;
end
end
```