

Exercises 4.4

3. Study the limitations for the location of intermediate nodes in a four-node bar element. Assume that the nodes are placed symmetrically.

```
clear all
clc
```

```
syms xi alpha L
```

```
C = [-L/2 ; L/2 ; -L/6; alpha*L];
j = C'* lin_deriv (xi);
simplify(j);
J = subs(j, L, 1) == 0;
alfa = [subs(J, xi, -1/3); ...
        subs(J, xi, 1 )];
for i = 1:2
    A(i, 1) = solve (alfa(i));
end
fprintf ('[%0.2f , %0.2f]*L\n',A)
```

```
[-0.17 , 0.28]*L
```

```
function dn = lin_deriv (xi)
n = [1.0/16.0*( -9.0*xi^3 + 9.0*xi*xi +      xi - 1.0)
      1.0/16.0*( 9.0*xi^3 + 9.0*xi*xi -      xi - 1.0)
      1.0/16.0*( 27.0*xi^3 - 9.0*xi*xi - 27.0*xi + 9.0)
      1.0/16.0*(-27.0*xi^3 - 9.0*xi*xi + 27.0*xi + 9.0)];
dn = diff(n);
end
```