Computer Implementation 6.1 *(Matlab)* *Mapping lines (p. 392)*

The calculations for mapping lines can be conveniently performed in *Mathematica*. Consider finding mapping for a line that passes through the following four points. The master element nodes are listed as well.

MatlabFiles\Chap6\LineMappingEx.m

```
% Mapping for a cubic line defined by the following four points
pts = [0,1; 3,3; 4,5; 5,6];
xn=pts(:,1); yn= pts(:,2);
map=[];
for s=-1:1/15:1
   % n = Cubic Lagrange interpolation functions
   n = [(-9*(-1 + s)*(-1/3 + s)*(1/3 + s))/16, ...
        (27*(-1 + s)*(-1/3 + s)*(1 + s))/16, ...
        (-27*(-1 + s)*(1/3 + s)*(1 + s))/16, ...
        (9*(-1/3 + s)*(1/3 + s)*(1 + s))/16];
   x = n*xn; y=n*yn;
   map=[map; [x,y]];
end
fprintf('Coordinates of point on the mapped line');
map'
plot(map(:,1), map(:,2))

>> LineMappingEx
Coordinates of point on the mapped line
ans =

 Columns 1 through 7

      0    0.4470    0.8560    1.2290    1.5680    1.8750    2.1520
   1.0000    1.1715    1.3520    1.5405    1.7360    1.9375    2.1440

 Columns 8 through 14

   2.4010    2.6240    2.8230    3.0000    3.1570    3.2960    3.4190
   2.3545    2.5680    2.7835    3.0000    3.2165    3.4320    3.6455

 Columns 15 through 21

   3.5280    3.6250    3.7120    3.7910    3.8640    3.9330    4.0000
   3.8560    4.0625    4.2640    4.4595    4.6480    4.8285    5.0000

 Columns 22 through 28
```

```
4.0670   4.1360   4.2090   4.2880   4.3750   4.4720   4.5810
5.1615   5.3120   5.4505   5.5760   5.6875   5.7840   5.8645
```

Columns 29 through 31

```
4.7040   4.8430   5.0000
5.9280   5.9735   6.0000
```