Computer Implementation 1.12 *(Matlab)* *Heat element results (p. 53)*

The solution for each element for a heat flow problem can easily be generated by writing a simple function in *Matlab*. The following *HeatTriResults* function returns the temperature $T(x, y)$ and its x and y derivatives for each element at the center of each element.

MatlabFiles\Chap1\HeatTriResults.m

```
function results = HeatTriResults(coord, tn)
% results = HeatTriResults(coord, tn)
% Computes element solution for a heat flow triangular element
% coord = nodal coordinates
% tn = nodal temperatures
% Output variables are T and its x and y derivatives at element center

x1=coord(1,1); y1=coord(1,2);
x2=coord(2,1); y2=coord(2,2);
x3=coord(3,1); y3=coord(3,2);
x=(x1+x2+x3)/3; y=(y1+y2+y3)/3;
b1 = y2 - y3; b2 = y3 - y1; b3 = y1 - y2;
c1 = x3 - x2; c2 = x1 - x3; c3 = x2 - x1;
f1 = x2*y3 - x3*y2; f2 = x3*y1 - x1*y3; f3 = x1*y2 - x2*y1;
A = (f1 + f2 + f3)/2;
n = [f1 + x*b1 + y*c1, f2 + x*b2 + y*c2, f3 + x*b3 + y*c3]/(2*A);
T = n*tn; dTdx=[b1, b2, b3]*tn/(2*A); dTdy=[c1, c2, c3]*tn/(2*A);
results=[T, dTdx, dTdy];
```