```
In[169]:= ClearAll["Global`*"]
N6i = {{1 - 3 ε - 3 η + 2 ε^2 + 2 η^2 + 4 ε * η}, {2 ε^2 - ε},
    {2 η^2 - η}, {4 ε - 4 ε^2 - 4 ε * η}, {4 ε * η}, {4 η - 4 η^2 - 4 ε * η}};
MatrixForm[N6i]
N6j = Transpose[N6i];
(*N3i={{1-ε-η},{ε},{η}};
MatrixForm[N3i]
  N3j=Transpose[N3i];*)

(*xj={{15,18,16,16.5,17,15.5}};
yj={{22,23.5,26,22.75,24.75,24}};*)
xj = {{x1, x2, x3, (x1 + x2) / 2, (x2 + x3) / 2, (x3 + x1) / 2}};
yj = {{y1, y2, y3, (y1 + y2) / 2, (y2 + y3) / 2, (y3 + y1) / 2}};
xi = Transpose[xj];
yi = Transpose[yj];

xa = N6j.xi;
ya = N6j.yi;

dxade = D[xa, ε];
dyade = D[ya, ε];
dxadn = D[xa, η];
dyadn = D[ya, η];

dxade = dxade[[1, 1]];
dyade = dyade[[1, 1]];
dxadn = dxadn[[1, 1]];
dyadn = dyadn[[1, 1]];

J = {{dxade, dyade}, {dxadn, dyadn}};
mJ = Det[J];
mJ = Collect[mJ, {ε, η}]
B = Inverse[J];
MatrixForm[Simplify[Collect[J, {ε, η}]]]
MatrixForm[Simplify[Collect[B, {ε, η}]]]
```

Out[171]//MatrixForm=

$$\begin{pmatrix} 1 - 3\,\epsilon + 2\,\epsilon^2 - 3\,\eta + 4\,\epsilon\,\eta + 2\,\eta^2 \\ -\epsilon + 2\,\epsilon^2 \\ -\eta + 2\,\eta^2 \\ 4\,\epsilon - 4\,\epsilon^2 - 4\,\epsilon\,\eta \\ 4\,\epsilon\,\eta \\ 4\,\eta - 4\,\epsilon\,\eta - 4\,\eta^2 \end{pmatrix}$$

Out[189]= $-x2\,y1 + x3\,y1 + x1\,y2 - x3\,y2 - x1\,y3 + x2\,y3$

Out[191]//MatrixForm=

$$\begin{pmatrix} -x1 + x2 & -y1 + y2 \\ -x1 + x3 & -y1 + y3 \end{pmatrix}$$

Out[192]//MatrixForm=

$$\begin{pmatrix} \dfrac{y1-y3}{x2\,y1-x3\,y1-x1\,y2+x3\,y2+x1\,y3-x2\,y3} & \dfrac{y1-y2}{x3\,(y1-y2)+x1\,(y2-y3)+x2\,(-y1+y3)} \\[2ex] \dfrac{x1-x3}{x3\,(y1-y2)+x1\,(y2-y3)+x2\,(-y1+y3)} & \dfrac{x1-x2}{x2\,y1-x3\,y1-x1\,y2+x3\,y2+x1\,y3-x2\,y3} \end{pmatrix}$$