→ CUBIC

BIPOLAR INTERPOLATION

or

$$v(x,y) = \sum_{i=0}^{3} \sum_{j=0}^{3} a_{ij} x^i y^j$$

$$a_{00} + a_{01} y + a_{02} y^2 + a_{03} y^3$$

$$a_{10} x + a_{11} xy + a_{12} xy^2 + a_{13} xy^3$$

$$a_{20} x^2 + a_{21} x^2 y + a_{22} x^2 y^2 + a_{23} x^2 y^3$$

$$a_{30} x^3 + a_{31} x^3 y + a_{32} x^3 y^2 + a_{33} x^3 y^3$$

Number of unknown variables are 16.

$$v(x,y) = \begin{bmatrix} 1 & x & x^2 & x^3 \end{bmatrix} \begin{bmatrix} a_{00} & a_{01} & a_{02} & a_{03} \\ a_{10} & - & - & - \\ a_{20} & | & . & . \\ a_{30} & | & ! & a_{33} \end{bmatrix} \begin{bmatrix} 1 \\ y \\ y^2 \\ y^3 \end{bmatrix}$$

or $v(x,y) = \begin{bmatrix} 1 & y & \cdots & x^3 y^3 \end{bmatrix}_{1\times 16} \begin{bmatrix} a_{00} \\ a_{01} \\ \vdots \\ a_{33} \end{bmatrix}_{16\times 1} \rightarrow A$

B_1

$$\begin{bmatrix} V_1 \\ \vdots \\ V_{16} \end{bmatrix} = \begin{bmatrix} B_1 \\ B_2 \\ \vdots \\ B_{16} \end{bmatrix} \begin{bmatrix} A \end{bmatrix}$$

Teacher's Signature.....

We require 16 points so that

$$B = \begin{bmatrix} B_1 \\ \vdots \\ B_{16} \end{bmatrix}$$ can be a square matrix & its inverse can be calculated

$$V = BA$$

$$\boxed{B^{-1} \cdot V = A}$$

Teacher's signature.....