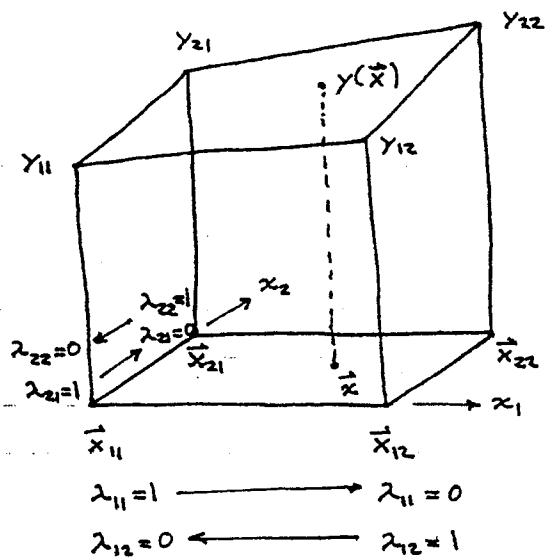


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tool: The following formula gives the linear interpolation of data points located at the four corners of a square.

$$y(\vec{x}) = \lambda_{11}\lambda_{21}y_{11} + \lambda_{12}\lambda_{21}y_{12} + \lambda_{11}\lambda_{22}y_{21} + \lambda_{12}\lambda_{22}y_{22}$$



note:  $(\vec{x} - \vec{x}_{11})_1 \equiv x_1$  component of  $\vec{x} - \vec{x}_{11}$

$$\text{where } \lambda_{11} \equiv \frac{(\vec{x}_{12} - \vec{x})_1}{(\vec{x}_{12} - \vec{x}_{11})_1} \quad \lambda_{12} \equiv \frac{(\vec{x} - \vec{x}_{11})_1}{(\vec{x}_{12} - \vec{x}_{11})_1}$$

$$\lambda_{21} \equiv \frac{(\vec{x}_{21} - \vec{x})_2}{(\vec{x}_{21} - \vec{x}_{11})_2} \quad \lambda_{22} \equiv \frac{(\vec{x} - \vec{x}_{11})_2}{(\vec{x}_{21} - \vec{x}_{11})_2}$$

check: Values at corners e.g.  $y(\vec{x}_{11}) = 1 \cdot 1 \cdot y_{11} + 0 + 0 + 0 = y_{11} \checkmark$

values halfway along edge e.g.  $y\left(\frac{\vec{x}_{11} + \vec{x}_{12}}{2}\right) = \frac{1}{2} \cdot 1 \cdot y_{11} + \frac{1}{2} \cdot 1 \cdot y_{12}$

value in center  $y\left(\frac{\vec{x}_{11} + \vec{x}_{12} + \vec{x}_{21} + \vec{x}_{22}}{4}\right) = \frac{1}{2} \cdot 0 \cdot y_{21} + \frac{1}{2} \cdot 0 \cdot y_{22} \checkmark$

$$= \frac{1}{2} \cdot \frac{1}{2} \cdot (y_1 + y_2 + y_3 + y_4) \checkmark$$

note: The surface is not generally planar even though every cross section is linear in either direction.