$$|J| = \frac{\partial x}{\partial \xi}\frac{\partial y}{\partial \eta} - \frac{\partial x}{\partial \eta}\frac{\partial y}{\partial \xi}$$

JACOBIANO DA TRANSFORMAÇÃO

$$\frac{\partial \xi}{\partial x} = \frac{1}{|J|}\frac{\partial y}{\partial \eta}$$

$$\frac{\partial \eta}{\partial y} = \frac{1}{|J|}\frac{\partial x}{\partial \xi}$$

$$\frac{\partial \xi}{\partial y} = -\frac{1}{|J|}\frac{\partial x}{\partial \eta}$$

$$\frac{\partial \eta}{\partial x} = -\frac{1}{|J|}\frac{\partial y}{\partial \xi}$$

DERIVADAS

CÁLCULO DE DERIVADAS

$f(x,y)$ $\qquad$ $f(\xi,\eta)$

$$\frac{\partial f}{\partial x} = \frac{\partial f}{\partial \xi}\frac{\partial \xi}{\partial x} + \frac{\partial f}{\partial \eta}\frac{\partial \eta}{\partial x}$$

Assim:

$$\varepsilon_{xx} = \frac{\partial u_x}{\partial x} = \frac{\partial u_x}{\partial \xi}\frac{\partial \xi}{\partial x} + \frac{\partial u_x}{\partial \eta}\frac{\partial \eta}{\partial x}$$

$$\varepsilon_{xy} = \frac{\partial u_y}{\partial y} = \frac{\partial u_y}{\partial \xi}\frac{\partial \xi}{\partial y} + \frac{\partial u_y}{\partial \eta}\frac{\partial \eta}{\partial y}$$

$$\gamma_{xy} = \frac{\partial u_x}{\partial y} + \frac{\partial u_y}{\partial x}$$

$$= \frac{\partial u_x}{\partial \xi}\frac{\partial \xi}{\partial y} + \frac{\partial u_x}{\partial \eta}\frac{\partial \eta}{\partial y} + \frac{\partial u_y}{\partial \eta}\frac{\partial \xi}{\partial x} + \frac{\partial u_y}{\partial \eta}\frac{\partial \eta}{\partial x}$$