$x = x(u,v)$, $y = y(u,v)$

Jacobian matrix:

$$J(u,v) = \frac{\partial(x,y)}{\partial(u,v)} = \begin{bmatrix} \frac{\partial x}{\partial u} & \frac{\partial x}{\partial v} \\ \frac{\partial y}{\partial u} & \frac{\partial y}{\partial v} \end{bmatrix}$$

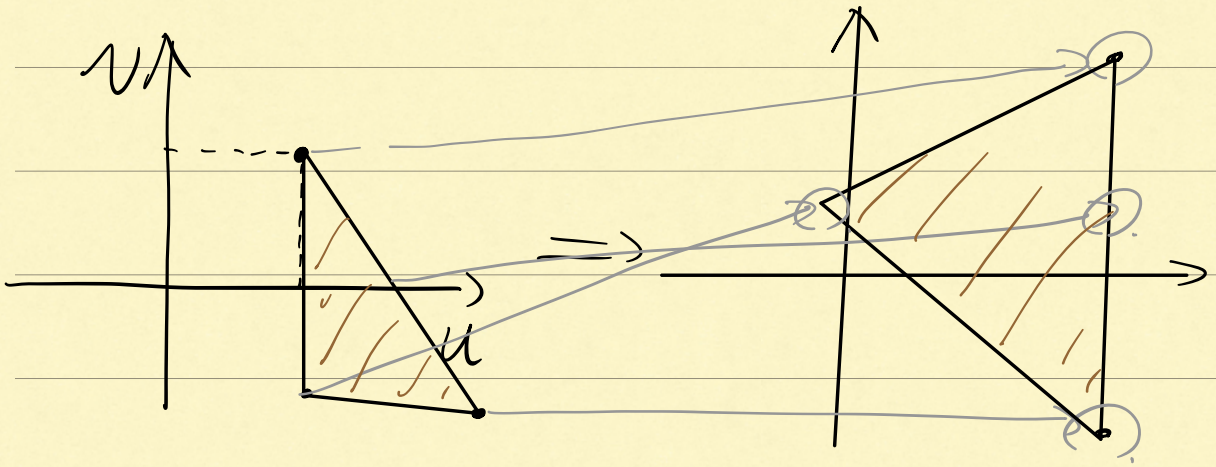
$$dx = \frac{\partial x}{\partial u}\,du + \frac{\partial x}{\partial v}\,dv.$$

$$dy = \frac{\partial y}{\partial u}\,du + \frac{\partial y}{\partial v}\,dv.$$

$$\begin{bmatrix} x \\ y \end{bmatrix} = J(u,v) \begin{bmatrix} u \\ v \end{bmatrix}$$

$$(x,y) = f(u,v)$$

$$f^{-1}(x,y) = (u,v)$$



$$\iint_S d(x,y) = \iint_S df(u,v)$$

$$= \iint_{S'} \left|\frac{d(x,y)}{d(u,v)}\right| d(u,v)$$

$\Rightarrow |J|$：u,v 某值时与 x,y 比的系数.

$\varepsilon \to 0$

$\left|\frac{d(x,y)}{d(u,v)}\right|$ → (u,v) 每变化 ε 面积时 (x,y) 变化的倍数