

f
n param.

$\varphi_1, \dots, \varphi_r$
s param

$$F(\quad) = f(\varphi_1, \varphi_2, \dots, \varphi_r)$$

s param

$$\frac{\partial F}{\partial x_j} = \sum \frac{\partial f}{\partial \varphi_i} \cdot \frac{\partial \varphi_i}{\partial x_j}$$

~~matrix~~

$$\sqrt{u \cdot v}$$

variable

$$u = xy$$

$$v = x+y$$

$$(uv)^{\frac{1}{2}} = \frac{1}{2}(uv)^{-\frac{1}{2}}$$

$$F = \sqrt{u(x,y) \cdot v(x,y)}$$

(x,y)

$$\frac{\partial F}{\partial x} = \frac{\partial F}{\partial u} \cdot \frac{\partial u}{\partial x} + \frac{\partial F}{\partial v} \cdot \frac{\partial v}{\partial x}$$

$$\frac{\partial F}{\partial x} = \frac{1}{2} \cdot \frac{1}{\sqrt{uv}} \cdot v \cdot y + \frac{1}{2} \cdot \frac{1}{\sqrt{uv}} \cdot u \cdot 1$$

$$= \frac{1}{2} \cdot \frac{1}{\sqrt{(x+y)(x+y)}} (x+y) \cdot y + \frac{1}{2} \cdot \frac{1}{\sqrt{xy(x+y)}} \cdot xy$$

$$F(x, y, z) = x^n f\left(\frac{y}{ax}, \frac{z}{by}\right)$$

a, b ∈ ℝ

$$x \frac{\partial F}{\partial x} + y \frac{\partial F}{\partial y} + z \frac{\partial F}{\partial z} = n \cdot F$$

$\frac{1}{a} y \cdot \frac{1}{x}$

$f(u, v)$ $u = \frac{y}{ax}$ $v = \frac{z}{by} = \frac{1}{b} z \cdot \frac{1}{y}$

$$F(x, y, z) = x^n f\left(u(y, x), v(y, z)\right)$$

$$\frac{\partial F}{\partial x} = n x^{n-1} f(u, v) + x^n \left[\frac{\partial f}{\partial u} \cdot \frac{\partial u}{\partial x} + \frac{\partial f}{\partial v} \cdot \frac{\partial v}{\partial x} \right]$$

$\frac{1}{ay} \cdot \frac{-1}{x^2}$

$\frac{\partial f}{\partial v} \cdot 0$

$$\frac{\partial F}{\partial y} = x^n \left[\frac{\partial f}{\partial u} \cdot \frac{\partial u}{\partial y} + \frac{\partial f}{\partial v} \cdot \frac{\partial v}{\partial y} \right]$$

$\frac{1}{ax}$

$\frac{1}{bz} - \frac{1}{y^2}$

$$\frac{\partial F}{\partial z} = x^n \left[\frac{\partial f}{\partial u} \cdot \frac{\partial u}{\partial z} + \frac{\partial f}{\partial v} \cdot \frac{\partial v}{\partial z} \right]$$

0

$\frac{1}{by}$

$$x(n x^{n-1} f(u, v) + x^n \left[\frac{\partial f}{\partial u} \cdot \frac{1}{ax} + \frac{\partial f}{\partial v} \cdot \frac{1}{by} \right]) +$$

$$y x^n \left[\frac{\partial f}{\partial u} \cdot \frac{1}{ax} + \frac{\partial f}{\partial v} \cdot \left(\frac{1}{bz} - \frac{1}{y^2} \right) \right] +$$

$$z x^n \left[\frac{\partial f}{\partial u} \cdot \frac{1}{ax} + \frac{\partial f}{\partial v} \cdot \frac{1}{by} \right]$$

