$$r_x = i + 0\cdot j + \frac{\partial f}{\partial x} k$$

$$r_y = 0\cdot i + j + \frac{\partial f}{\partial y} k$$

$$r_x \times r_y = \begin{vmatrix} i & j & k \\ 1 & 0 & \frac{\partial f}{\partial x} \\ 0 & 1 & \frac{\partial f}{\partial y} \end{vmatrix} = -\frac{\partial f}{\partial x} i - \frac{\partial f}{\partial y} + k$$

$$|r_x \times r_y| = \sqrt{\left(\frac{\partial f}{\partial x}\right)^2 + \left(\frac{\partial f}{\partial y}\right)^2 + 1^2}$$

$$\therefore \quad A(S) = \iint \sqrt{\left(\frac{\partial f}{\partial x}\right)^2 + \left(\frac{\partial f}{\partial y}\right)^2 + 1}\, dA$$

§ 17.7 SURFACE INTEGRAL.

$$\text{total mass} = \iint f(x(u,v), y(u,v), z(u,v)) |r_u \times r_v| \, du\, dv$$

$$= \iint_S f(x,y,z)\, dS$$

refers to surface integral.