Formulas & Definitions: Section 15-5

Definition: Let S be a surface with equation $z = f(x, y)$, where f has continuous partial derivatives. We define the **surface area** of S to be

$$A(S) = \lim_{m,n \to \infty} \sum_{i=1}^{m} \sum_{j=1}^{n} \Delta T_{ij}$$

Formula: The area of the surface with equation $z = f(x, y)$, $(x, y \in D)$, where f_x and f_y are continuous, is

$$A(S) = \iint_D \sqrt{[f_x(x, y)]^2 + [f_y(x, y)]^2 + 1}\, dA$$

or

$$A(S) = \iint_D \sqrt{1 + (\partial z / \partial x)^2 + (\partial z / \partial y)^2}\, dA.$$