

Lecture 27

14.5. Surface Area

Goals: (1) Use double integral to find the area of a surface.

Questions:

- How to find the area using cross product (11.4)?
- How to find the arc length of a curve (7.4)?

14.5.1. Surface area

(1) Definition of surface area:

If f and its partial derivatives are continuous on the closed region R in the xy -plane, then the area of the surface S given by $z = f(x, y)$ over R is given by

$$\iint_R dS = \iint_R \sqrt{1 + [f'_x(x, y)]^2 + [f'_y(x, y)]^2} dA.$$

Note: this is similar to the formula of arc length.

- (2) Examples 1, 2: finding surface areas (pp. 1021-1022)
- (3) Examples 3, 4: finding surface areas by using polar coordinates (pp. 1022-1123)
Try exercises 1-18, 29-34.
- (4) Example 5: using Simpson's Rule for evaluating the integral if the integrand is hard to integrate.

14.5.2. Homework Set #27

- Read 14.5 (pages 1020-1024).
- Do exercises on pages 1025-1026:
1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 29, 31, 33