

## 13.5: Surface Area

### 1. Definition of Surface Area

If  $f$  and its first 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

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

### 2. Sometimes converting from rectangular to polar coordinates is easier.

$$x = r \cos \theta$$

Recall:  $y = r \sin \theta$