§15.4 #s 1, 4, 6, 7, 10, 13, 16, 17, 19, 22, 25, 29, 35

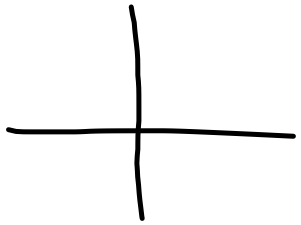
Under $z = x^2 + y^2 = f(x,y) = r^2$

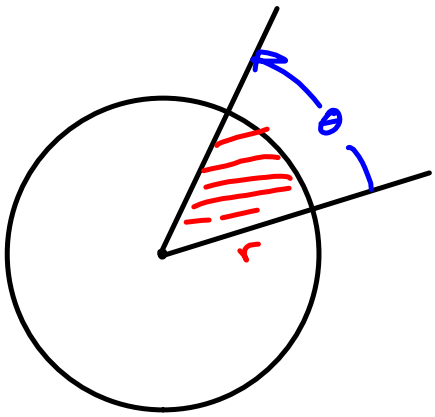
Example 4 wants a w/. -tzup

$x^2 + y^2 = 2x$

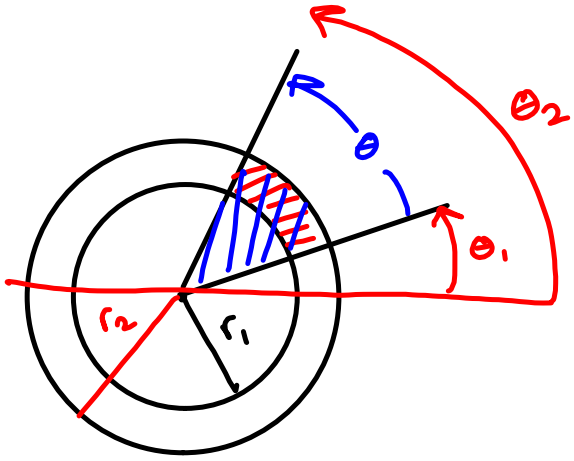
$r^2 = 2r\cos\theta$

$r = 2\cos\theta$





$\text{Area} = \frac{1}{2}\theta r^2$

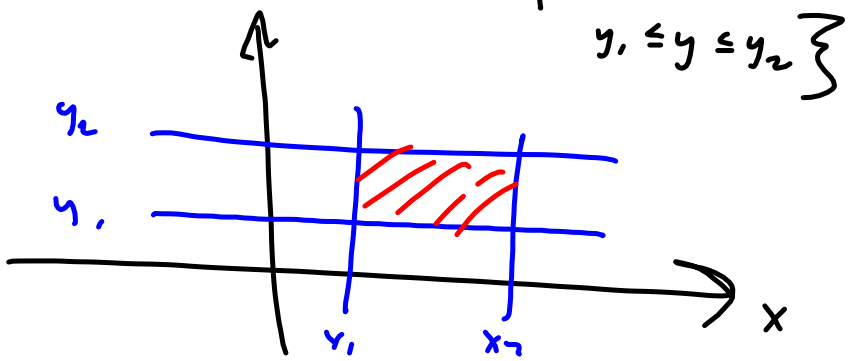


$\frac{1}{2}r_2^2\Theta - \frac{1}{2}r_1^2\Theta$

= Area of the polar rectangle:

$\{(r,\theta) \mid r_1 \le r \le r_2,\ \theta_1 \le \theta \le \theta_2\}$

Rectangle Rectangle: $\{(x,y) \mid x_1 \le x \le x_2,\ y_1 \le y \le y_2\}$



§15.1 - 15.3 questions.

Area of Polar Rectange R_{ij}

$r = \cos(3\theta)$

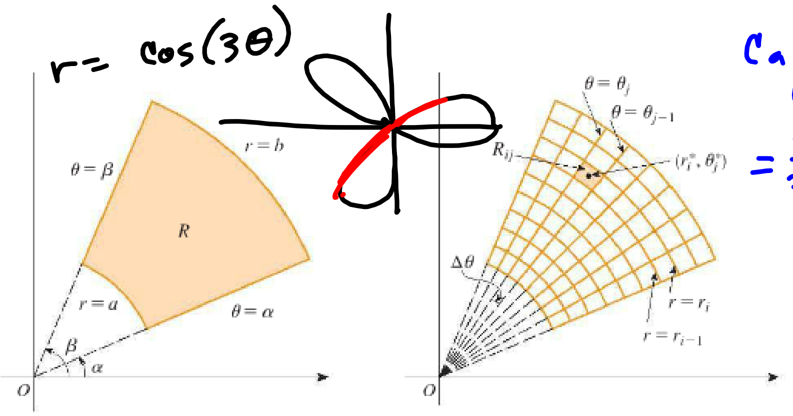


FIGURE 3 Polar rectangle **FIGURE 4** Dividing R into polar subrectangles

Call $r_i^* =$ midpoint $= \frac{1}{2}(r_i + r_{i-1})$

$$\frac{1}{2} r_i^2 \Delta\theta - \frac{1}{2} r_{i-1}^2 \Delta\theta$$

$$= \frac{1}{2}(r_i^2 - r_{i-1}^2)\Delta\theta = \frac{1}{2}(r_i + r_{i-1})(r_i - r_{i-1})\Delta\theta$$

$$= r_i^* \Delta r \Delta\theta$$

Volume under $f(x,y)$ over R region:

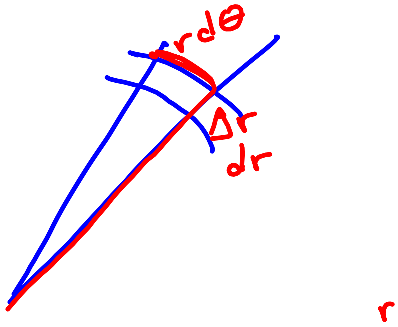
$$\iint_R f(x,y)\, dA \quad \leftarrow dy\,dx$$

your dA.

$$= \int_{\theta_1}^{\theta_2}\int_{r_1}^{r_2} f(r\cos\theta, r\sin\theta)\, r\, dr\, d\theta$$

$r f(x,y) = g(x,y)$ is not necessary. stuff

Volume under $f(x,y)$ on nice polar region



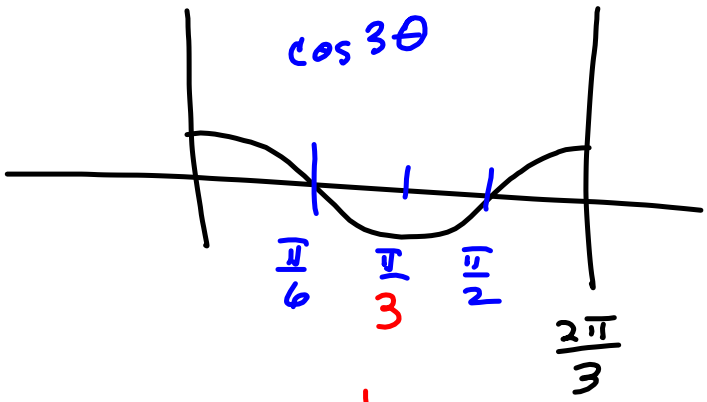
See Chapter 10 (10.3 and 10.4) for review on these suckers!

$f(x,y) = 1$ case.

$$\iint r \, dr \, d\theta$$

= AREA !

You can also apply £10 tech to finding the areas on a few.


cos 3θ
π/6
π/3
π/2
2π/3