

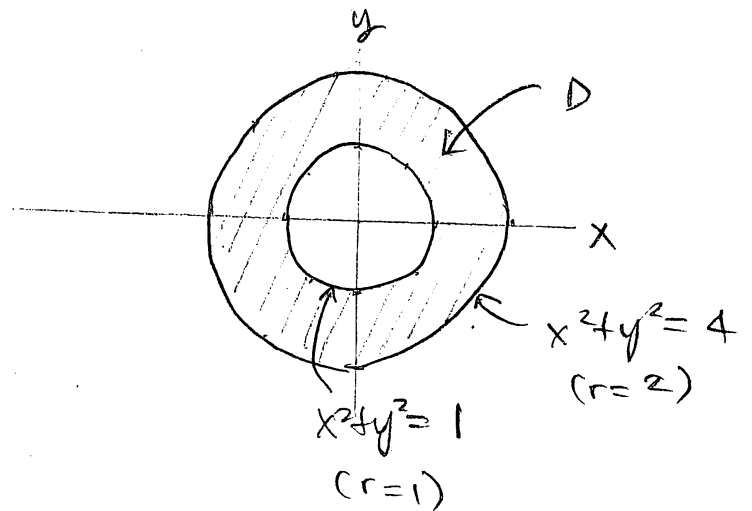
Homework #6

$$z = y^2 - x^2$$

$$z_x = -2x \quad \textcircled{1}$$

$$z_y = 2y \quad \textcircled{1}$$

$$\begin{aligned} \sqrt{z_x^2 + z_y^2 + 1} &= \sqrt{4(x^2 + y^2) + 1} \\ &= \sqrt{4r^2 + 1} \end{aligned}$$



$$A(s) = \iint_D \sqrt{z_x^2 + z_y^2 + 1} \, dA$$

$$\textcircled{1} \int_0^{2\pi} \int_1^2 \sqrt{4r^2 + 1} \, r \, dr \, d\theta \quad \textcircled{1} \quad \textcircled{1} \quad \textcircled{1}$$

$$\textcircled{1} \int_0^{2\pi} d\theta \int_1^2 r \sqrt{4r^2 + 1} \, dr \quad \textcircled{1}$$

$$= 2\pi \int_5^{17} \sqrt{u} \frac{du}{8} \quad \textcircled{1}$$

$$= \frac{\pi}{4} \left[\frac{2u^{3/2}}{3} \right]_5^{17} \quad \textcircled{1}$$

$$= \frac{\pi}{16} (17\sqrt{17} - 5\sqrt{5}) \quad \textcircled{1}$$

$$\textcircled{1} \quad u = 4r^2 + 1$$

$$\textcircled{1} \quad du = 8r \, dr$$

$$\textcircled{1} \quad r=1 \rightarrow u=5$$

$$\textcircled{1} \quad r=2 \rightarrow u=17$$