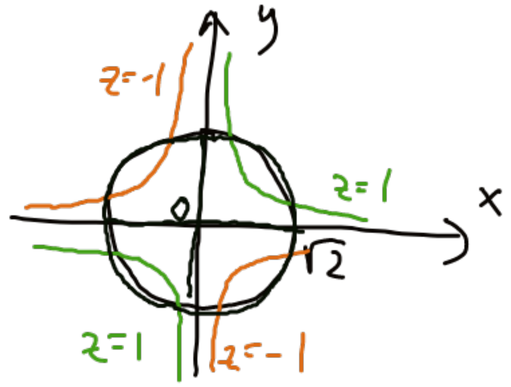
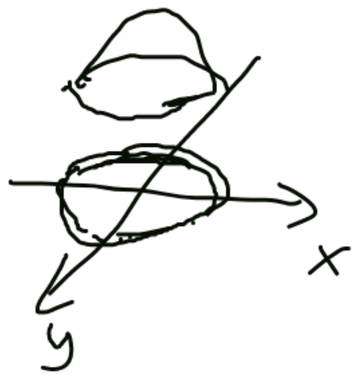
XXII/1 $D: x^2+y^2=2$ $\quad z = xy = f(x,y)$

$r^2 \to r \in \langle 0, \sqrt{2} \rangle$





$$P = \iint_D \sqrt{1 + (f_x)^2 + (f_y)^2}\, dx\, dy$$

$f_x = (xy)'_x = y \qquad f_y = (xy)'_y = x$

$\alpha \in \langle 0, 2\pi \rangle$

$$\int_0^{\sqrt{2}} dr \int_0^{2\pi} r\sqrt{1 + \cancel{x^2} + \cancel{y^2}}\, d\alpha = \int_0^{\sqrt{2}} dr \cdot \left(r\sqrt{1+r^2} \int_0^{2\pi} 1\, d\alpha \right) = \int_0^{\sqrt{2}} r\sqrt{1+r^2}\,(2\pi - 0)\, dr$$

r^2

$$= 2\pi \int_0^{\sqrt{2}} r\sqrt{1+r^2}\, dr = \left| \begin{array}{l} t = 1 + r^2 \\ dt = 2r\, dr \end{array} \right| = \frac{2\pi}{2} \int_1^{\cancel{3}} \sqrt{t}\, dt =$$

$$= \pi \int_{\cancel{0}1}^{\cancel{3}} t^{1/2}\, dt = \pi \left| \frac{2}{3} t^{3/2} \right|_1^3 = \frac{2}{3}\pi \left| (1+r^2)^{3/2} \right| = \frac{2}{3}\pi \left(3^{3/2} - 1 \right) =$$

$$= \frac{2}{3}\pi \left(\sqrt{27} - 1 \right) = \frac{2}{3}\pi \left(3\sqrt{3} - 1 \right)$$