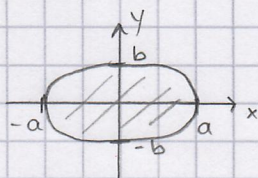


Aufgabe 1

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$$

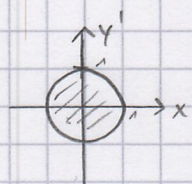


gesucht: Fläche der beschriebenen Ellipse

$$A = \iint_{\mathbb{F}} dx dy = \int_{x=-a}^a \int_{y=-b\sqrt{1-\frac{x^2}{a^2}}}^{+b\sqrt{1-\frac{x^2}{a^2}}} dy dx$$

Substituiere: $x' = \frac{x}{a}$ und $y' = \frac{y}{b}$ $dx = a dx'$, $dy = b dy'$

$$A = ab \int_{x'=-1}^1 \int_{y'=-\sqrt{1-x'^2}}^{+\sqrt{1-x'^2}} dy' dx'$$



Substituiere Polarkoordinaten:

$$x' = r \cos \varphi \quad y' = r \sin \varphi, \quad dx' dy' = r dr d\varphi$$

$$A = ab \int_{r=0}^1 \int_{\varphi=0}^{2\pi} r dr d\varphi = 2\pi \cdot ab \cdot \left[\frac{1}{2} r^2 \right]_0^1 = \underline{\underline{\pi ab}}$$