$$\int_0^{2\pi}\int_a^b \frac{\cancel{x}\, y^2}{\pi(x^2+y^2)}\, \cancel{dx\,dy} \quad r\,dr\,d\theta \qquad x = r\cos\theta$$

$$\int_0^{2\pi}\int \frac{\cancel{r^2}\sin^2\theta}{\pi\, \cancel{r^2}}\, r\,dr\,d\theta$$

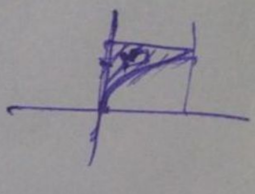
$$= \frac{(b^2-a^2)}{\pi\;\;2} \times \left\{ \frac{\theta}{2} - \frac{\sin(2\theta)}{4} \right]_0^{2\pi}$$

$$= \frac{(b^2-a^2)}{\pi\;\;2} \times \{\pi\} = \frac{1}{\pi}\frac{\pi}{2}(b^2-a^2) = \boxed{\frac{b^2-a^2}{2}}$$

$$\int_0^1\int_0^{y^n} \sqrt{y^{1+n}+1}\; dx\,dy \longleftarrow \int_0^1\int_{x^{1/n}}^1 \sqrt{y^{1+n}+1}\; dy\,dx \;\cancel{dx\,dy}$$

$x^{1/n} = y$

$n =$



$$= \int_0^1 \left(\sqrt{y^{n+1}+1}\right) y^n\, dy$$

$y^{n+1}+1 = t$

$(n+1)y^n\, dy = dt$

$$= \int_1^2 \frac{\sqrt{t}\; dt}{n+1}$$

$$= \frac{1}{(n+1)} \frac{2(\sqrt{t})^{3/2}}{3} = \frac{2}{3(n+1)}\left[2\sqrt{2}-1\right] \times \frac{3}{2} \times \frac{(n+1)^2}{[2\sqrt{2}-1]}$$

$$= \boxed{n+1}$$