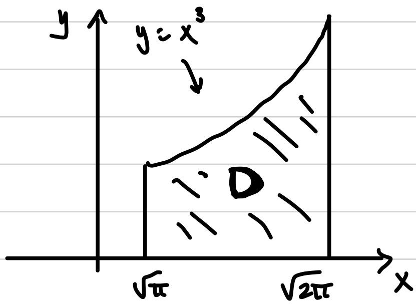
Now, balance ease of describing region with the function being integrated.



<u>Ex</u> $\iint_D \sin\left(\frac{y}{x}\right) dA.$

integrate first w.r.t. y.

$$= \int_{\sqrt{\pi}}^{\sqrt{2\pi}} \int_0^{x^3} \sin\left(\frac{y}{x}\right) dy\, dx$$

endpts of projection

curves

$$= \int_{\sqrt{\pi}}^{\sqrt{2\pi}} -x\cos\left(\frac{y}{x}\right)\Bigg|_{y=0}^{y=x^3} dx$$

$$= \int_{\sqrt{\pi}}^{\sqrt{2\pi}} -x\cos\left(\frac{x^3}{x}\right) + x\, dx$$

$u = x^2$

$du = 2x\,dx$

$dx = \frac{du}{2x}$

$\int_?^? -\frac{x \cos u\, du}{2x}$

$= \int -\frac{1}{2}\cos u\, du$

$= -\frac{1}{2}\sin x^2$

$$= -\frac{1}{2}\sin(x^2) + \frac{1}{2}x^2\Bigg|_{\sqrt{\pi}}^{\sqrt{2\pi}}$$

$$= \frac{2\pi}{2} - \frac{\pi}{2} = \frac{\pi}{2}.$$