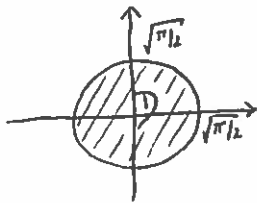


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**Problem 1** (10 points) Use polar coordinates to evaluate the double integral  $\iint_D 2 \cos(x^2 + y^2) dA$  where  $D$  is the disk  $D = \{(r, \theta) \mid 0 \leq \theta \leq 2\pi, 0 \leq r \leq \sqrt{\pi/2}\}$ .

$$0 \leq r \leq \sqrt{\frac{\pi}{2}}$$

$$0 \leq r^2 \leq \frac{\pi}{2}$$



$$\iint_D \cos(x^2 + y^2) dA$$

$$\int_0^{2\pi} \int_0^{\sqrt{\frac{\pi}{2}}} r \cos r^2 dr d\theta$$

$$\int_0^{2\pi} d\theta \cdot \int_0^{\sqrt{\frac{\pi}{2}}} r \cos r^2 dr$$

$$2\pi \cdot \left. \frac{\sin r^2}{2} \right|_0^{\sqrt{\frac{\pi}{2}}}$$

$$2\pi \cdot \frac{1}{2}$$

$\pi$

**Problem 2** (10 points) Evaluate the iterated integral  $\int_0^1 \int_0^x \int_0^2 (x + y) dz dy dx$ .

$$\int_0^1 \int_0^x \int_0^2 (x + y) dz dy dx$$

$$2 \int_0^1 \int_0^x (x + y) dy dx$$

$$2 \int_0^1 \left. xy + \frac{y^2}{2} \right|_0^x dx$$

$$2 \int_0^1 \left( x^2 + \frac{x^2}{2} \right) dx$$

$$2 \int_0^1 \frac{3}{2} x^2 dx$$

$$3 \int_0^1 x^2 dx$$

$$3 \cdot \left. \frac{x^3}{3} \right|_0^1$$

$$x^3 \Big|_0^1$$

$1$