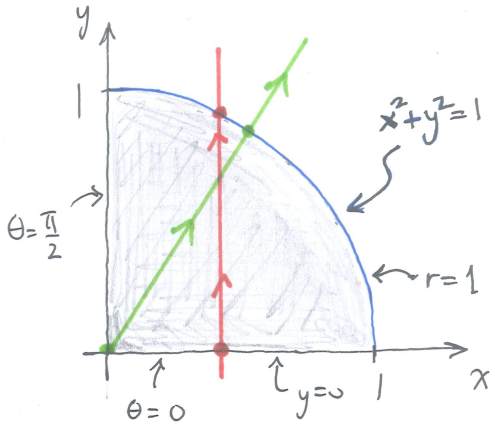
1. Evaluate the following integrals where $D = \{(x, y) : x^2 + y^2 \leq 1, x \geq 0 \text{ and } y \geq 0\}$.

a. $\iint_D \cos\left(\frac{\pi}{2}(x^2+y^2)\right) dA = \int_0^{\pi/2} \int_0^1 \cos\left(\frac{\pi}{2} r^2\right) r \, dr \, d\theta$

$= \int_0^{\pi/2} \left[\frac{1}{\pi} \sin\left(\frac{\pi}{2} r^2\right)\right]_{r=0}^{r=1} d\theta = \frac{1}{\pi} \int_0^{\pi/2} d\theta = \frac{1}{\pi} \cdot \frac{\pi}{2} = \frac{1}{2}$



b. $\iint_D y^3(x - x^3)\cos(\pi y^4) \, dA = \int_0^1 \int_0^{\sqrt{1-x^2}} y^3 (x - x^3) \cos(\pi y^4) \, dy \, dx$

$= \int_0^1 (x - x^3) \cdot \left[\frac{1}{4\pi} \sin(\pi y^4)\right]_{y=0}^{y=\sqrt{1-x^2}} dx$

$= \frac{1}{4\pi} \int_0^1 (x - x^3) \sin\left(\pi (1-x^2)^2\right) dx = \frac{1}{4\pi} \left[\frac{1}{4\pi} \cos\left(\pi (1-x^2)^2\right)\right]_{x=0}^{x=1}$

$= \frac{1}{16\pi^2} \cdot (\cos 0 - \cos \pi) = \frac{1}{8\pi^2}$