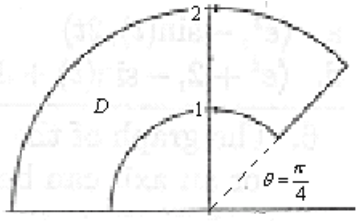
Homework Section 15.4

1. Set up an iterated integral in polar coordinates that equals $\iint_D f(x,y)dA$ if D is the region given in the following picture:



2. Sketch the region whose area is given by the integral and evaluate the integral: $\int_{\pi/2}^{3\pi/2}\int_1^3 r dr d\theta$.

3. Covert to polar coordinates and evaluate:

   a) $\iint_R xydA,\ R=\{(x,y)\mid x^2+y^2\le 9, x\ge 0, y\ge 0\}$

   b) $\iint_R (x+y)dA,\ R=\{(x,y)\mid x^2+y^2\ge 1,\ x^2+y^2\le 9,\ x\ge 0,\ \text{and } y\ge 0\ \}$

   c) $\iint_R e^{x^2+y^2}dA$, where R is the region bounded by $y=-\sqrt{4-x^2}$ and the x-axis.

   d) $\int_{-1}^{1}\int_{-\sqrt{1-x^2}}^{\sqrt{1-x^2}} \cos\left(x^2+y^2\right)dydx$

4. Find the area of one petal of the rose curve given by $r=\cos 3\theta$.

5. Calculate the volume:

   a) Underneath $z=x^2+y^2$ and above the region $R=\{(x,y)\mid x^2+y^2\le 16\}$.

   b) Within the sphere $x^2+y^2+z^2=25$ and outside the cylinder $x^2+y^2=9$.

   c) Within the half-cone $z=\sqrt{x^2+y^2}$ and inside the sphere $x^2+y^2+z^2=4$.