Assignment 3

Coverage: 15.4 in Text.

Exercises: 15.4. no 13, 15, 17, 19, 22, 24, 25, 27, 29, 30, 34, 35, 40, 42, 43, 46.

Submit no. 22, 24, 27, 35 by Feb 2.

Supplementary Problems

1. Express the straight line $ax+by=1,\ a,b>0$, in polar coordinates. How about $ax+by=0$?

2. Express the hyperbola $x^2-y^2=1$ $(y\geq 0)$ in polar coordinates? How about $xy=a^2>0$ in the first quadrant?

3. Discuss the existence of the improper integral

$$\iint_D \frac{y}{(x^2+y^2)^{3/2}}\ ,$$

where D is the region enclosed by the polar graph $r=1+\cos\theta$.

You are required to submit the following questions by **2 Feb 23:00 on Gradescope.**

Q22

Change the Cartesian integral into an equivalent polar integral. Then evaluate the polar integral.

$$\int_1^2 \int_0^{\sqrt{2x-x^2}} \frac{1}{(x^2+y^2)^2}\, dy\, dx$$

Q24

Sketch the region of integration and covert the polar integral to a Catesian integral. Do not evaluate the integrals.

$$\int_{\frac{\pi}{6}}^{\frac{\pi}{2}} \int_1^{\csc\theta} r^2 \cos\theta\, dr\, d\theta$$

I made a typo here, instead of $r\cos\theta$, the integrand should be $r^2\cos\theta$.

Q27

Find the area of the region cut from the first quadrant by the curve $r = 2(2 - \sin 2\theta)^{\frac{1}{2}}$.

Q35

Average distance from interior of disk to center. Find the average distance from a point $P(x, y)$ in the disk $x^2 + y^2 \leq a^2$ to the origin.