ESP
Kouba
Worksheet 16

1.) Find the area of the region bounded by the graphs of $\theta = \pi/6$, $\theta = \pi/4$, and $r = \sec\theta$.

2.) Find the area of the region lying inside the graph of $r = 2 + \sin\theta$ and outside the graph of $r = \cos\theta$.

3.) Find the area of the region lying inside the graph of $r = 4\sin\theta$ and above the graph of $r = \csc\theta$.

4.) Find the area of *one leaf* of the graph of

a.) $r = \sin 2\theta$
b.) $r = \sin 3\theta$

5.) Find all points of intersection (in polar coordinates) of the following pairs of polar equations. Begin by sketching the graph of each equation. In part f.) a good estimate of the point(s) of intersection will do.

a.) $\theta = \pi/3$, $r = 1 + 1/2 \cos\theta$
b.) $r = 1/2$, $r = \cos\theta$
c.) $r = \sin\theta$, $r = \sqrt{3}\cos\theta$
d.) $r = 1 - \sin\theta$, $r = \sin\theta$
e.) $r = 1 + \sin\theta$, $r = \csc\theta$
f.) $r = \theta$, $r = 3\sin\theta$

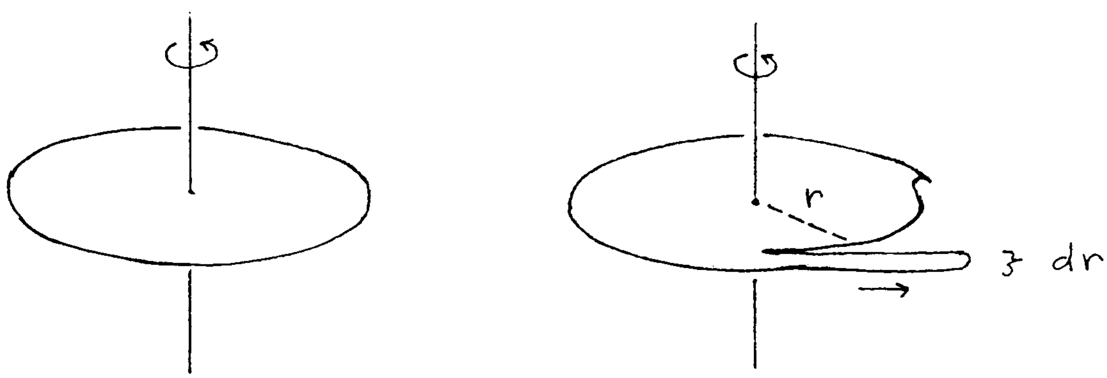
6.) Sketch the graph of $r = \dfrac{1}{\cos\theta + 1}$. What is it ?

7.) Sketch the graph of $r = 1/\theta$ for $0 < \theta \leq 2\pi$.

8.) Consider a flat, spinning circular disc of mass M and radius a and constant density. It rotates about an axis perpendicular to its face and passing through its center f times per second.

a.) Calculate the total kinetic energy of the spinnig disc.
b.) Assume that the disc (while spinning) starts to deteriorate and

" spin off " thin slices until the disc is gone ? Find the total kinetic energy of these slices if each slice is " dr " thick and " $2\pi r$ " long. What happens to the total kinetic energy ?




9.) Determine whether the following improper integrals are convergent or divergent.

a.) $\displaystyle\int_3^{\infty} \frac{1}{\sqrt{x-3}}\,dx$

b.) $\displaystyle\int_0^{2} \frac{2x}{x^2-1}\,dx$

c.) $\displaystyle\int_0^{\pi} \tan x\,dx$

d.) $\displaystyle\int_0^{1} \frac{1}{\sqrt{1-x^2}}\,dx$

e.) $\displaystyle\int_0^{\infty} \frac{x^2}{(x^3+1)^3}\,dx$