Recitation # 24: Calculus in polar coordinates - Instructor Notes

Warm up:

(a) True or False: The slope of the tangent line to the curve $r = f(\theta)$ at the point (r_0, θ_0) is given by $f'(\theta_0)$.

(b) True or False: The area enclosed by the curve $r = 2\cos(\theta)$ is

$$\int_0^{2\pi} \frac{1}{2}(2\cos(\theta))^2 d\theta = \int_0^{2\pi} 1 - \cos(2\theta) d\theta = 2\pi.$$

Instructor Notes: The point of b is for the students to realize that you need to think about the curve before blindly using a formula.

Group work:

Problem 1 *Find the equation of the tangent line to* $r = 2 - \sin\theta$ *at* $\theta = \dfrac{\pi}{3}$. *Also, determine for what values of* θ *the tangent lines to the curve are vertical or horizontal.*

Instructor Notes: They probably haven't seen how to find the other angle for which $\sin\theta = \dfrac{1-\sqrt{3}}{2}$ since Pre-Calculus.

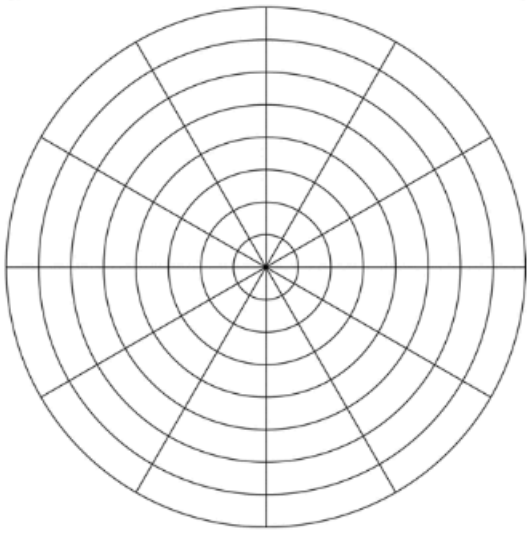
Problem 2 *Graph each region and then SET UP an integral for the area of the region:*

(a) *Outside the small loop and inside the large loop of* $r = 3 - 6\sin\theta$.

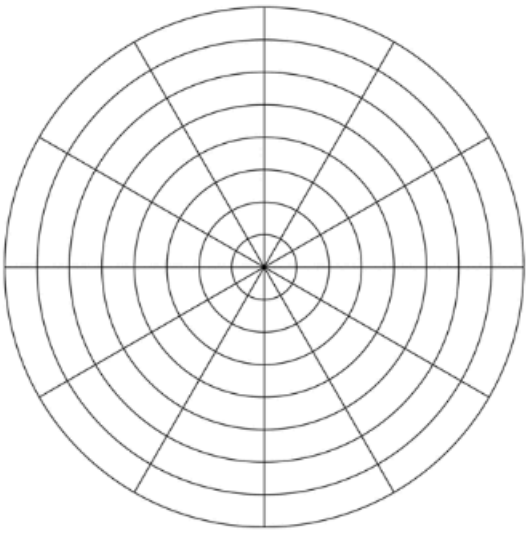
(b) *Inside both of the curves* $r = 4\cos\theta$ *and* $r = 1 - \cos\theta$.

Note that you do not need to evaluate these integrals.

a.



b.



Instructor Notes: If you have time at the end, you can go over how you would evaluate these integrals.