

## Recitation # 24: Calculus in polar coordinates

### Warm up:

- (a) True or False: The slope of the tangent line to the curve  $r = f(\theta)$  at the point  $(r_0, \theta_0)$  is given by  $f'(\theta_0)$ .
- (b) True or False: The area enclosed by the curve  $r = 2 \cos(\theta)$  is

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

### Group work:

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

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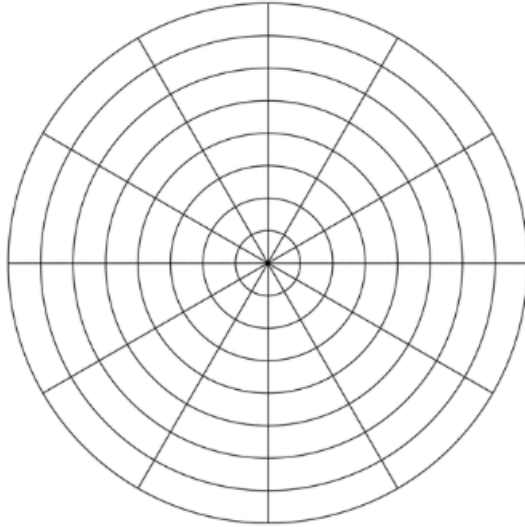
**Problem 2** Graph each region and then SET UP an integral for the area of the region:

- (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.*

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**a.**



**b.**

