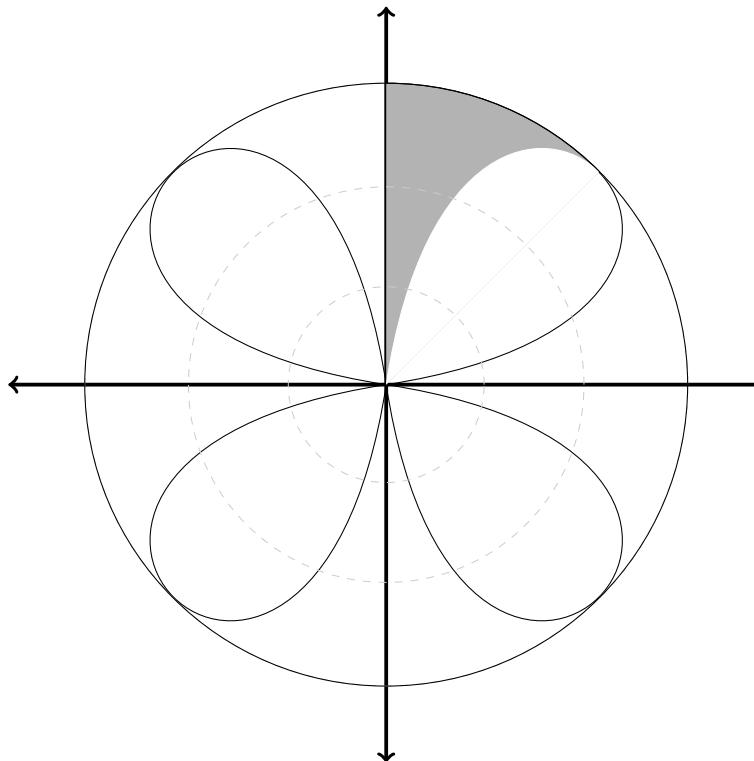


1. The graphs of  $r = 3$  and  $r = 3 \sin(2\theta)$  are shown below.



Set up an integral for the area of the shaded region, but don't solve it

*Answer.* First, we need to find the bounds of integration. You can see from the picture (or you can plot it in cartesian coordinates, that the shaded area lies in between the angles  $\pi/4 \leq \theta \leq \pi/2$ .

So now we just need to integrate each curve with these bounds, and subtract the area of the inside from the area of the outside. Using the formula:  $area = 1/2 \int r^2 d\theta$ , we get

$$A = 1/2 \int_{\pi/2}^{\pi/4} 3^2 d\theta - 1/2 \int_{\pi/2}^{\pi/4} (3 \sin(2\theta))^2 d\theta$$

□

$$\text{Answer: } 1/2 \int_{\pi/2}^{\pi/4} (9 - 9 \sin^2(2\theta)) d\theta$$

2. a) Find all points of intersection of the curves, in polar coordinates

$$r = 4 \cos(3\theta) \text{ and}$$

$$r = 2$$

*Answer.* In the second curve, the radius is 2 regardless of the angle, so we need only figure out when the first curve has a radius of 2. The graph below suggests that there should be 6 solutions.

$$2 = 4 \cos(3\theta)$$

$$1/2 = \cos(3\theta)$$

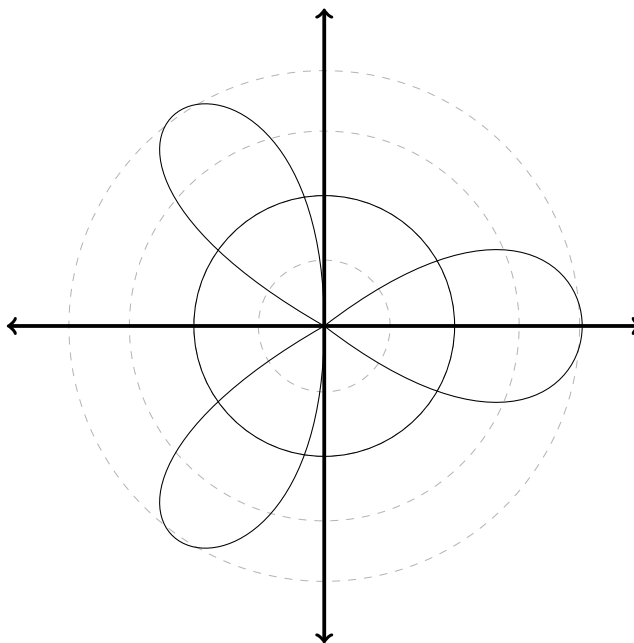
$$3\theta = \frac{\pi}{3}, \frac{5\pi}{3}, \frac{7\pi}{3}, \frac{11\pi}{3}, \frac{13\pi}{3}, \frac{17\pi}{3} \dots$$

and so

□

$$\text{Answer: } \theta = \frac{\pi}{9}, \frac{5\pi}{9}, \frac{7\pi}{9}, \frac{11\pi}{9}, \frac{13\pi}{9}, \frac{17\pi}{9}$$

- b) Graph the curves on the axes below



3. a) What was your favorite part of this class?

Answer: ALL OF IT

- b) What was your least favorite part of this class?

Answer: N/A