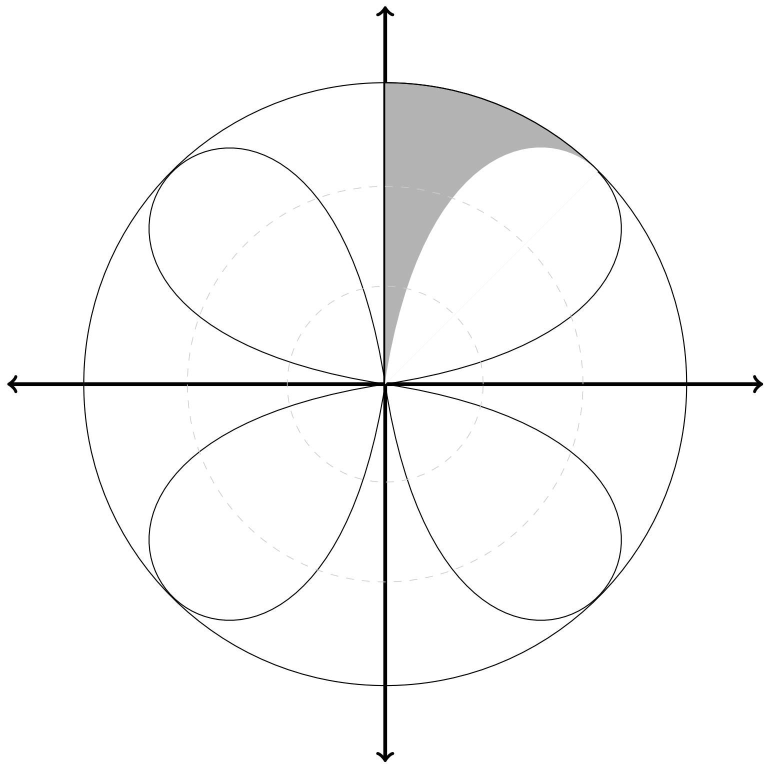
1. The graphs of $r = 3$ and $r = 3\sin(2\theta)$ are shown below.



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 $\pi/4 \le \theta \le \pi/2$.

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* $= 1/2 \int r^2 \, \mathrm{d}\theta$, we get

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

□

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

2. a) Find all points of intersection of the curves, in polar coordinates
$r = 4\cos(3\theta)$ 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.

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

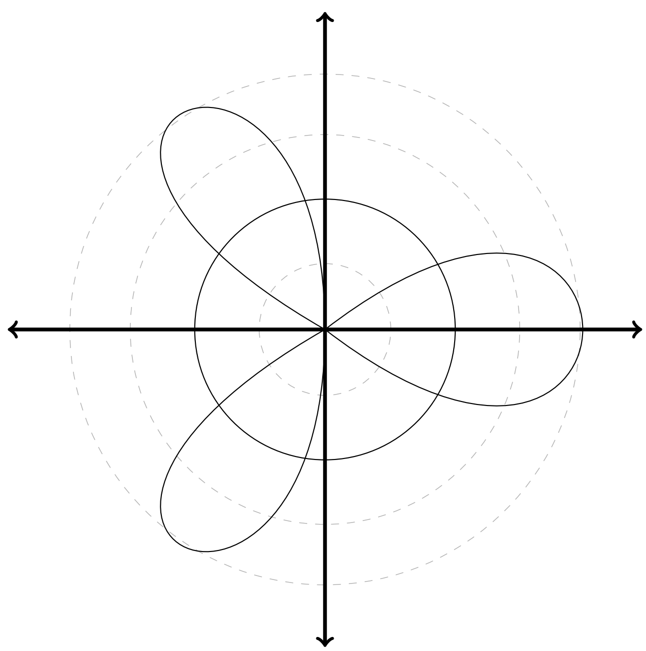
$$1/2 = \cos(3\theta)$$

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

and so □

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