

Math 199, Fall 2022
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Participation assignment 18 - More polar coordinates

Estimated time: 45 minutes.

Point value: 3 points.

Goals: Practice with polar coordinates.

1) Each of the following equations represents a line in polar coordinates. For each one, sketch the line, and find a Cartesian equation that describes the same line. (Do this in whichever order you find easier.)

(a) $r \cos\left(\theta + \frac{\pi}{3}\right) = 2\sqrt{3}$

(b) $r = 2 \sec \theta$

(c) $r = -\frac{3}{2} \csc \theta$

2) Consider the parametrically defined curve:

$$x = e^{2t} \cos t, \quad y = e^{2t} \sin t.$$

(a) Find an equation for the curve in polar coordinates.

(b) Graph the curve on the interval $[-2\pi, 2\pi]$.

(c) Find the (arc)length of the curve on the interval $[-2\pi, 2\pi]$.

3) Express the polar equation $r = \frac{5}{1 + 2 \cos \theta}$ in Cartesian coordinates. (Your answer should be *quadratic*, i.e. it should only involve terms which are multiples of 1, x , y , xy , x^2 , y^2 .) Do you know what shape this equation describes?

4) Graph the polar curves. Give each one a name.

(a) $r = 1 - 2 \sin(3\theta)$

(b) $r = 1 + 2 \sin \frac{\theta}{2}$