Parameterizations and Polar Coordinates

Math 53, section 213

September 5, 2014

Problems on parametric equations

1. Let C be the curve $x = 2\cos t$, $y = \sin t$.

   (a) What kind of curve is this? Sketch the curve.

   (b) Find the slope of the tangent line to the curve when $t = 0$, $t = \pi/4$, and $t = \pi/2$.

   (c) Find the area of the region enclosed by C.

2. Compute the arc length of the curve parameterized by $x = \cos(e^t)$, $y = \sin(e^t)$, $0 \leq t \leq 1$. (Hint: Reparameterize.)

3. **The orbit of the moon around the sun:** The earth travels around the sun once every year, and the moon travels around the earth approximately once every $1/13$ of a year. Find a parametric equation that describes the orbit of the moon around the sun (with the sun at the origin).

Problems on polar coordinates

1. Sketch the following curves given by equations in polar coordinates. (Taken from problem 54 in section 10.3)

   (a) $r = \sqrt{\theta}$

   (b) $r = \theta^2$

   (c) $r = 2 + \sin(3\theta)$

   (d) $r = 1 + 2\sin(3\theta)$

2. Find a polar coordinates equation that describes a flower-like shape with five "petals".