Weekly Assignment 11

MAT 229, Spring 2021

Instructions: **Show your work!**

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1. Polar curves

A. Consider the two polar curves $r = 1$ and $r = 2 + 2\cos(\theta)$.

a. Find polar coordinates for all points of intersection.

b. Find the area of the region that is inside $r = 2 + 2\cos(\theta)$ and outside $r = 1$.

B. Consider the polar curve $r = \theta$ (An Archimedean spiral).

a. Find the length of the curve swept out after n complete rotations from angle 0; your answer should be a formula involving n.

b. Find the **area** of the region that is swept out over the **last** complete rotation when using n complete rotations from angle 0; your answer should be a formula involving n. (You might use a circle as an approximation to check your answer.)

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2. Shapes in space

Let P be the point with Cartesian coordinates (2, 1, 4) and Q be the point (4, 3, 10).

a. What is the distance between them?

b. What are the coordinates for the midpoint of the line segment $\overline{PQ}$?

c. Find an equation for the sphere that has a diameter with one endpoint at P and the other at Q.

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3. Unit vectors

a. Find the two unit vectors that are parallel to vector $\langle 2, 6 \rangle$.