Weekly Assignment 10

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 Archimedian spiral!).

c. Find the length of the curve for an integral number of turns n about the origin.

d. Find the **physical area** of the region that is swept out after an integral number of turns. (You might use a circle to approximate, to check your answer.)

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.

3. Unit vectors

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