Unit 5 Group Work
MultiV 2021-22 / Dr. Kessner

Have fun!

1. In $\mathbb{R}^2$, parametrize the quarter circle of radius 2 from $(2, 0)$ to $(0, 2)$ (as a curve). Find the length and centroid of the curve using integration.

Now revolve the curve around the y-axis and consider the generated surface (a hemispherical shell). Find the lateral surface area of the hemisphere in 4 different ways:

- use a formula from geometry
- use Pappus' Centroid Theorem
- compute the surface area of revolution as a single integral
- parametrize the surface and compute a double integral

2. Consider the 2-dimensional region bounded by the quarter circle above and the axes $x = 0$ and $y = 0$. Find the area and centroid of the region by integration.

Now consider the hemispherical volume generated by revolving the region around the y-axis. Find the volume of the hemisphere in 4 different ways:

- use a formula from geometry
- use Pappus' Centroid Theorem
- compute the volume of revolution as a triple integral in cylindrical coordinates in two ways (disks and shells).