

**Unit 5 HW (Pappus' Theorem)**  
**MultiV 2021-22 / Dr. Kessner**

**Have fun!**

**1.** Parametrize the line segment in  $\mathbb{R}^2$  from  $(0, 1)$  to  $(4, 4)$ . Find the length and centroid of the line segment (using integration).

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

- use a formula
- 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 triangle bounded by the same line segment and the lines  $x = 0$  and  $y = 4$ . Find the area and centroid of the triangle by integration.

Now consider the solid cone generated by revolving the triangle around the y-axis. Find the volume of the cone in 4 different ways:

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