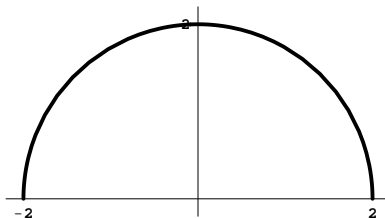


Calculate the  $y$ -coordinate of the center of mass of a homogeneous piece of wire  $\omega$  shaped as shown below.



Parametrize  $\omega$  by  $\vec{c}(t)$

$$\vec{c}(t) = 2 \cos t \vec{i} + 2 \sin t \vec{j}$$

$$0 \leq t \leq \pi$$

Then  $\vec{c}'(t) = -2 \sin t \vec{i} + 2 \cos t \vec{j}$

$$ds = \|\vec{c}'(t)\| dt$$

$$= \sqrt{4 \sin^2 t + 4 \cos^2 t} dt$$

$$= 2 dt$$

So  $\int_{\omega} y ds = \int_0^{\pi} (2 \sin t)(2) dt$

$$= 4 \int_0^{\pi} \sin t dt$$

$$= 8$$

Length of semicircle is  $2\pi$ .

$$\bar{y} = \frac{8}{2\pi} = \frac{4}{\pi} \approx 1.27$$