

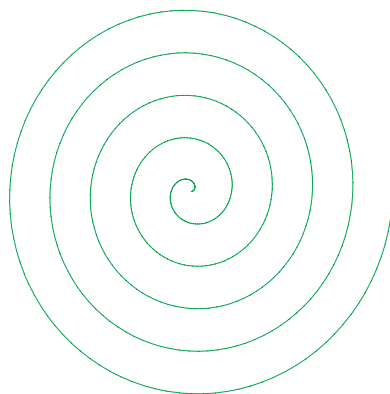
Sample problems for the second examination

1. Invent a problem about hydrostatic force for which the answer is

$$62.5 \int_0^4 4(4-y)\sqrt{y} dy.$$

2. The spiral of Archimedes has the parametric equations

$$\begin{aligned} x &= t \cos(t) \\ y &= t \sin(t) \end{aligned} \quad \text{for } t > 0.$$



Show that for integral N , the arc length of one loop of the spiral (from $t = 2N\pi$ to $t = 2N\pi + 2\pi$) differs from the arc length of a circle of radius $2N\pi + \pi$ by an amount that tends to 0 as N tends to ∞ .

