

Tutorial 5

1. (a) Find a curve with a positive derivative through the point (1,1) whose length integral is

$$L = \int_1^4 \sqrt{1 + \frac{1}{4x}} dx.$$

(b) How many such curves are there? Give reason for your answer.

2. Find the length of the curve $y = \int_0^x \sqrt{\cos 2t} dt$ from $x = 0$ to $x = \frac{\pi}{4}$.

3. Find the surface area of the cone frustum generated by revolving the line segment $y = \frac{x}{2} + \frac{1}{2}$, $1 \leq x \leq 3$, about the x-axis.

4. Find the area of the surface generated by revolving the upper half portion of the astroid

$$x^{\frac{2}{3}} + y^{\frac{2}{3}} = 1$$

about the x-axis.