

PROBLEM SET 9: AREA OF A SURFACE OF REVOLUTION

Note: Most of the problems were taken from the textbook [1].

Problem 1. Find the total area of of the surface resulting from rotating the curve

a) $y = x^3$, $0 \leq x \leq 2$ about the x -axis;

b) $y = \cos\left(\frac{1}{2}x\right)$, $0 \leq x \leq \pi$ about the x -axis;

c) $y = \frac{x^3}{6} + \frac{1}{2x}$, $1/2 \leq x \leq 1$ about the x -axis;

d) $x^{2/3} + y^{2/3} = 1$, $0 \leq y \leq 1$ about the y -axis;

e) $x = \frac{1}{4}y^2 - \frac{1}{2}\ln y$, $1 \leq y \leq 2$ about the y -axis.

Problem 2. Show that the total area of the surface of revolution obtained by rotating the curve $y = 1/x$ with $x \geq 1$ about the x -axis is infinite.

Problem 3. Show that the total area of the surface of revolution obtained by rotating the curve $y = e^{-x}$ with $x \geq 0$ about the x -axis is finite.

Problem 4. Show that the area of the sphere of radius r is $4\pi r^2$.

Problem 5. Find the total area of of the surface resulting from rotating the circle $x^2 + y^2 = r^2$ about the line $y = r$.

REFERENCES

- [1] J. Stewart: *Single Variable Calculus* 8th Edition, Cengage Learning, Boston 2015.