Area of Surfaces of Revolution: Examples

1. Find the area of the surface of revolution obtained by rotating the curve $y = \dfrac{x^3}{3}$ about the x-axis for $0 \le x \le 2$.

2. Write an integral that represents the surface area when the curve $y = \tan x$, $0 \le x \le \pi/4$ is revolved about the line $y = -2$.

3. Set up and simplify an integral for the area of the surface of revolution obtained by rotating $y = \dfrac{x^4}{16} + \dfrac{1}{2x^2}$, $1 \le x \le 2$ about the y-axis.

4. The curve $y = \sqrt{a^2 - x^2}$, $\dfrac{-3a}{4} \le x \le \dfrac{3a}{4}$ is rotated about the x-axis. Find the area of the resulting surface.

5. Find the surface area if the curve $y = \sqrt{9 - x^2}$, $1 \le x \le 2$ is rotated about the x-axis.

6. Find the area of the surface obtained by rotating $y = \sqrt{1 + 4x}$ about the x-axis for $1 \le x \le 5$

7. Set up, but do not evaluate, an integral for the area of the surface of revolution obtained by rotating the curve $y = 1 + 2x^2$, $1 \le x \le 4$ about the x-axis.

8. Set up, but do not evaluate, an integral to find the area of the surface of revolution obtained by rotating $y = \dfrac{1}{x}$ for $1 \le x \le 5$ about the line $y = 2$.

9. Set up, but do not evaluate, an integral to find the area of the surface of revolution obtained by rotating $y = \dfrac{1}{x}$ for $1 \le x < \infty$ about the x-axis (this surface is called **Gabriel's horn**). Show that this integral is divergent.

10. Show that the surface area of a sphere is given by $S = 4\pi r^2$

11. Find the surface area if the line segment from $(3, 3)$ to $(7, 0)$ in the xy-plane is rotated about the y-axis.

12. Set up an integral that represents the area of the surface of revolution generated by rotating the curve $y = \tan x$, $0 \le x \le \pi/4$ about the line $x = -2$.