

1 Shell Method

1. Let S be the solid obtained by rotating the region bounded by $y = \sin(x^2)$ and above the x -axis and rotated about the y -axis. Sketch the solid S and a typical cylindrical shell. Find the circumference and height of the shell and set up an integral. You do not need to solve the integral.

2. Use the method of cylindrical shells to find the volume of the solid generated by rotating the region bounded by $y = e^{-5x^2}$, $y = 0$, $x = 0$, and $x = 1$ about the y -axis.

3. Use the method of cylindrical shells to find the volume of the solid generated by rotating the region bounded by $f(x) = x^3$, $y = 8$, and $x = 0$ about the line $x = 3$.

4. Find the volume of the solid generated by rotating the region bounded by $x = 2y^2$ and $x = y^2 + 1$ about the line $y = -2$.

2 Work

1. A 360 pound gorilla climbs a tree to a height of 20 feet. Find the work done if the gorilla reaches that height in 10 seconds.
2. How much work is done when a hoist lifts a 200 kg rock to a height of 3 m?
3. A spring has a natural length of 40 cm. If a 60 N force is required to keep the spring compressed 10 cm, how much work is done during this compression? How much work is required to compress the spring to a length of 25 cm?

4. A 50 ft long heavy rope weighing 0.5 lb/ft hangs over the edge of a building that is 120 ft high. How much work is done to pull the rope to the top of the building?

5. Find the average value of the function $f(x) = e^{\sin t} \cos t$ on the interval $[0, \pi/2]$.

6. The linear density in a rod that is 8 m long is $12/\sqrt{x+1}$ kg/m, where x is measured in meters from one end of the rod. Find the average density of the rod.