

1. Find the volume of the solid that results from rotating the area between the curves $y^2 = x - 1$ and $y = x - 1$ around the y -axis.
2. Find the average value of $f(x) = \sin^3 x$ over the interval $[0, \pi]$.
3. Find the volume of the solid whose base is bounded by the circle $x^2 + y^2 = 4$ and whose cross sections perpendicular to the x -axis are squares.
4. It requires a force of **12 N** to hold a spring **0.1 m** longer than its natural length. How much work is required to stretch it from its natural length to **0.1 m** beyond its natural length?
5. Find the center of mass of the lamina of constant density bounded by $y = 2x - x^2$ and the x -axis.
6. Use the method of cylindrical shells to find the volume of the solid of revolution obtained by revolving the region bounded by the graphs of $y = x^2$ and $y = 2x$ about the line $x = 3$.
7. A **20 meter** chain with a mass of **100 kilograms** is hanging off the side of a **30 meter** tall building. How much work is required to pull **10 meters** of the chain to the top of the building?
8. Suppose that the trough, pictured below, is completely filled with pure water (density $= \rho \text{ kg/m}^3$). Calculate the exact total amount of work that must be done to pump all of the water out of trough. (Use $g \text{ m/s}^2$)

