MATH 107-253 Recitation 16

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October 22, 2015

1: Find the volume of the solid whose base is the region in the first quadrant bounded by $y = x^2$, $y = 1$, and the y-axis and whose cross-sections perpendicular to the x-axis are semicircles.

2: Find the equation (in terms of x and y) of the tangent line to the curve $r = 2\sin 4\theta$ at $\theta = \frac{\pi}{3}$.

3: A storage shed is the shape of a half-cylinder of radius r and length l.

(a) **What is the volume of the shed?**

(b) **The shed is filled with sawdust whose density (mass/unit volume) at any point is proportional to the distance of that point from the floor. The constant of proportionality is k. Calculate the total mass of sawdust in the shed.**

4: A bucket of water of mass 20 kg is pulled at constant velocity up to a platform 50 meters above the ground. This takes 20 minutes, during which time 4 kg of water drips out at a steady rate through a hole in the bottom. Find the work needed to raise the bucket to the platform. (Use $g = 9.8 \frac{m}{s^2}$.)