Math 128 : Calculus 2 for the Sciences	**Winter 2016**

Lecture 11: January 27, 2016

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11.1 Volumes Continued

Example 11.1 *Find the volume of the solid obtained by rotating the area bounded by $x = y^2$ and $x + y = 2$ about y = -3*

y = 1, - 2
volume of one shell $= 2\pi(y+3)(2-y-y^2)dy$

$$\begin{aligned} \textit{Total Volume} &= \int_{-2}^{1} 2\pi(y+3)(2-y-y^2)dy \\ &= \frac{45\pi}{2} \end{aligned}$$

Practice : Find the volume enclosed by $x = y^3, y = \sqrt{2-x}, y = 0$ rotated about y = 1
Try to use both vertical rectangles and horizontal rectangles.

Tips :

- Draw a diagram
- Check rotating both vertical and horizontal rectangles to determine which orientation to use
- Be careful with radius of cylinder/disk/washer if not rotating about x
- Limits of integration must be for same variable that is in the integral

11.2 Arc Length

Consider y = f(x)
If f(x) is continuous on [a,b], then the length of the curve y = f(x) on $a \leq x \leq b$ is

$$L = \int_a^b \sqrt{1 + (\frac{dy}{dx})^2}$$

If instead we have x = g(y) where $c \leq y \leq d$, then we use

$$L = \int_c^d \sqrt{1 + (\frac{dx}{dy})^2}$$

End of Lecture Notes
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