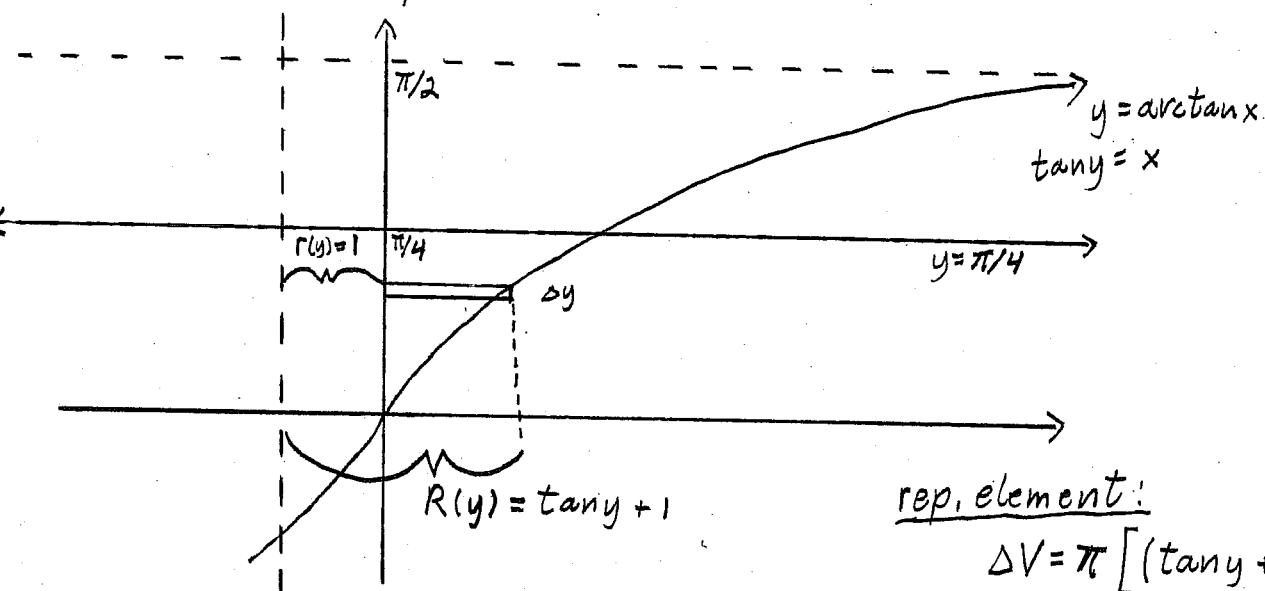


Washer Method:

Example:

Find the volume of a solid of revolution formed by rotating the region bounded by the following:

$$f(x) = \arctan x, y = \frac{\pi}{4}, x = 0, x = 1 \text{ about } x = -1$$



rep. element:

$$\Delta V = \pi [(\tan y + 1)^2 - 1^2] \Delta y$$

$$V = \int_0^{\pi/4} \pi [(\tan y + 1)^2 - 1] dy$$

$$= \int_0^{\pi/4} \pi [\tan^2 y + 2 \tan y + 1 - 1] dy$$

$$= \pi \int_0^{\pi/4} \tan^2 y + 2 \tan y dy$$

$$= \pi \int_0^{\pi/4} [\sec^2 y - 1] + 2 \tan y dy$$

$$= \pi \left[\tan y - y - 2 \ln |\cos y| \right]_0^{\pi/4}$$

$$= \pi \left[\tan \frac{\pi}{4} - \frac{\pi}{4} - 2 \ln |\cos \frac{\pi}{4}| \right] - \left[\tan 0 - 0 - 2 \ln |\cos 0| \right]$$

$$= \pi \left[1 - \frac{\pi}{4} - 2 \ln \left(\frac{1}{\sqrt{2}} \right) \right]$$