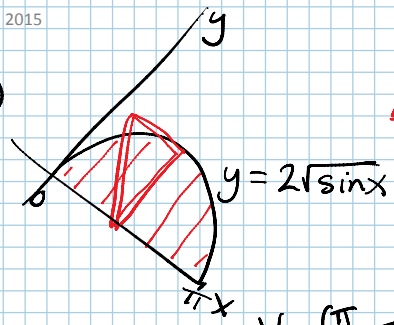
HW 7.3 p. 406 39-42

Friday, March 20, 2015
4:19 PM

(39) (a)



$A_\Delta = \frac{s^2\sqrt{3}}{4} = \frac{(2\sqrt{\sin x})^2\sqrt{3}}{4} = \sin x \cdot \sqrt{3}$

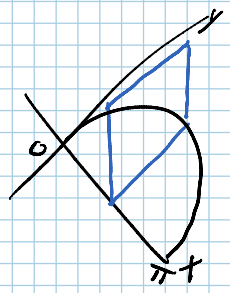
$\text{Vol}_{\text{cross sec}} = \sqrt{3}\sin x\,\Delta x$

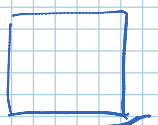
$V = \int_0^\pi \sqrt{3}\sin x\,dx = \sqrt{3}\left[-\cos x\right]_0^\pi = -\sqrt{3}\cos\pi - -\sqrt{3}\cos 0$

$= -\sqrt{3}(-1) + \sqrt{3}(1)$

$= \boxed{2\sqrt{3}}$

(b)



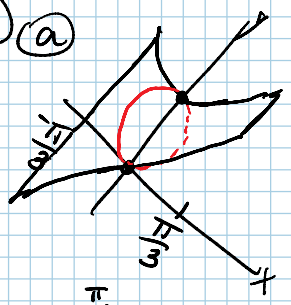


$A_{SQ} = (2\sqrt{\sin x})^2 = 4\sin x$

$V_{\text{cross sec}} = 4\sin x\,\Delta x$ ↑ see (a)

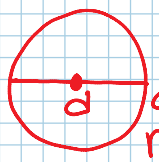
$V = \int_0^\pi 4\sin x\,dx = 4\left[-\cos x\right]_0^\pi = 4(2) = \boxed{8}$

(40) (a)



$\sec\frac{\pi}{3} = 2$ ← bigger

$\tan\frac{\pi}{3} = \sqrt{3}$



$d = \sec x - \tan x$

$r = \frac{\sec x - \tan x}{2}$

$A_\odot = \pi\left(\frac{\sec x - \tan x}{2}\right)^2 =$

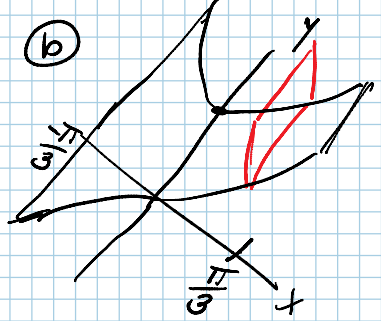
$\frac{\pi}{4}(\sec^2 x - 2\sec x\tan x + \tan^2 x)$

$V = \int_{-\frac{\pi}{3}}^{\frac{\pi}{3}} \frac{\pi}{4}\left[\sec^2 x - 2\sec x\tan x + \underbrace{\tan^2 x}_{=\sec^2 x - 1}\right]dx = \frac{\pi}{4}\int_{-\frac{\pi}{3}}^{\frac{\pi}{3}}\left[2\sec^2 x - 2\sec x\tan x - 1\right]dx =$

$= \frac{\pi}{4}\left[2\tan x - 2\sec x - x\right]_{-\frac{\pi}{3}}^{\frac{\pi}{3}} = \frac{\pi}{4}\left(2\tan\frac{\pi}{3} - 2\sec\frac{\pi}{3} - \frac{\pi}{3}\right) - \left(2\tan\frac{-\pi}{3} - 2\sec\frac{-\pi}{3} - \frac{-\pi}{3}\right)$

$= \frac{\pi}{4}\left(2\sqrt{3} - 4 - \frac{\pi}{3}\right) - \left(-2\sqrt{3} - 4 + \frac{\pi}{3}\right) = \frac{\pi}{4}\left(4\sqrt{3} - \frac{2\pi}{3}\right) = \boxed{\pi\sqrt{3} - \frac{\pi^2}{6}}$

(b)



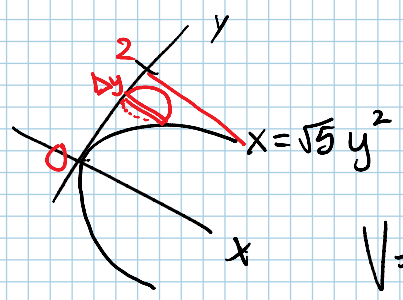
$A_{SQ} = (\sec x - \tan x)^2 = \sec^2 x - 2\sec x\tan x + \tan^2 x$

$V = \int_{-\frac{\pi}{3}}^{\frac{\pi}{3}}(\sec^2 x - 2\sec x\tan x + \tan^2 x)dx = \boxed{4\sqrt{3} - \frac{2\pi}{3}}$ ← see (a)

(41)

$\frac{\pi}{3}$

(41)

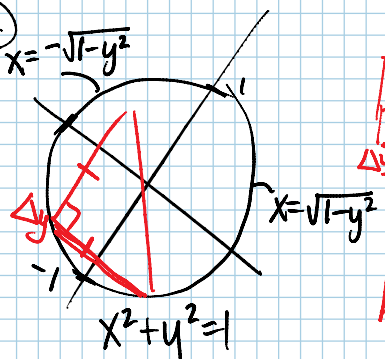


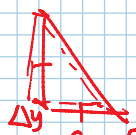
$d=\sqrt{5}y^2 \quad r=\frac{\sqrt{5}}{2}y^2$

$A_\odot=\pi\left(\frac{\sqrt{5}}{2}y^2\right)^2=\frac{5}{4}\pi y^4$

$$V=\int_0^2 \frac{5}{4}\pi y^4\,dy=\frac{5}{4}\pi\left[\frac{1}{5}y^5\right]_0^2=\frac{\pi}{4}2^5-0=\boxed{8\pi}$$

(42)





$s=\sqrt{1-y^2}-\left(-\sqrt{1-y^2}\right)$

$s=2\sqrt{1-y^2}$

$A_\Delta=\frac{1}{2}\left(2\sqrt{1-y^2}\right)^2=2(1-y^2)$

$$V=\int_{-1}^{1}2(1-y^2)\,dy=2\left(y-\frac{1}{3}y^3\right)\Big|_{-1}^{1}=2\left(1-\frac{1}{3}\right)-2\left(-1+\frac{1}{3}\right)=4-\frac{4}{3}=\boxed{\frac{8}{3}}$$