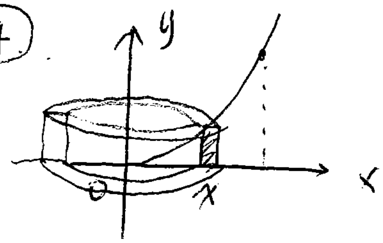
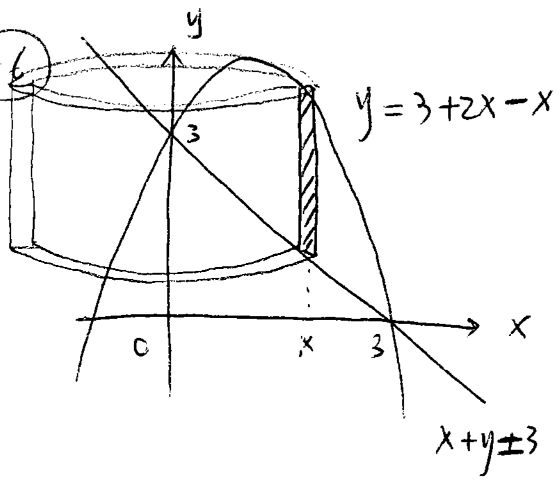
Section 6.3

#4



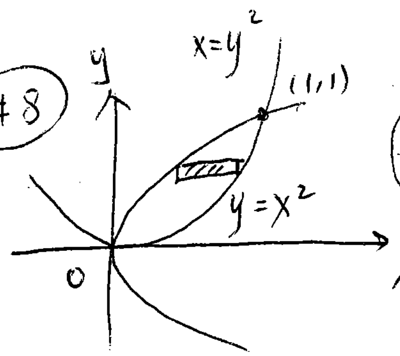
$$V=\int_0^1 2\pi x\cdot x^2\,dx = 2\pi\int_0^1 x^3\,dx = 2\pi\cdot\frac{x^4}{4}\Big|_0^1 = \frac{\pi}{2}$$

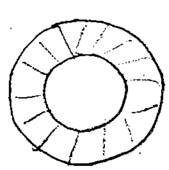
#6



$$\begin{aligned}V&=\int_0^3 2\pi x\cdot\left[(3+2x-x^2)-(3-x)\right]dx\\&=\int_0^3 2\pi x\cdot(3x-x^2)\,dx\\&=2\pi\int_0^3(3x^2-x^3)\,dx\\&=2\pi\left(x^3-\frac{x^4}{4}\right)\Big|_0^3\\&=2\pi\left(27-\frac{81}{4}\right)=2\pi\left(\frac{27}{4}\right)=\frac{27}{2}\pi\end{aligned}$$

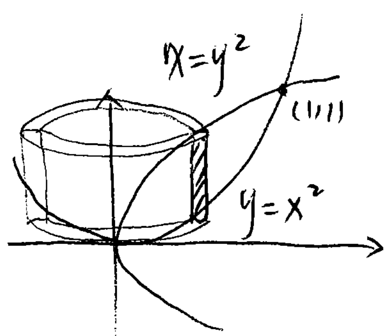
#8





By slicing:

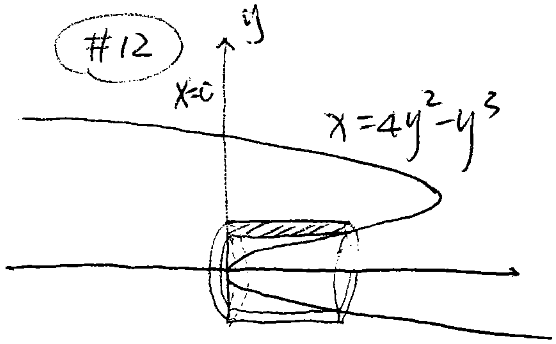
$$\begin{aligned}V&=\int_0^1 \pi\left[(\sqrt{y})^2-(y^2)^2\right]dy\\&=\pi\int_0^1(y-y^4)\,dy\\&=\pi\left(\frac{y^2}{2}-\frac{y^5}{5}\right)\Big|_0^1=\pi\left(\frac{1}{2}-\frac{1}{5}\right)=\frac{3}{10}\pi\end{aligned}$$



By cylindrical shells:

$$\begin{aligned}V&=\int_0^1 2\pi x(\sqrt{x}-x^2)\,dx\\&=\int_0^1 2\pi(x^{\frac{3}{2}}-x^3)\,dx\\&=2\pi\left(\frac{2}{5}x^{\frac{5}{2}}-\frac{1}{4}x^4\right)\Big|_0^1\\&=2\pi\left(\frac{2}{5}-\frac{1}{4}\right)=\frac{3}{10}\pi\end{aligned}$$

#12



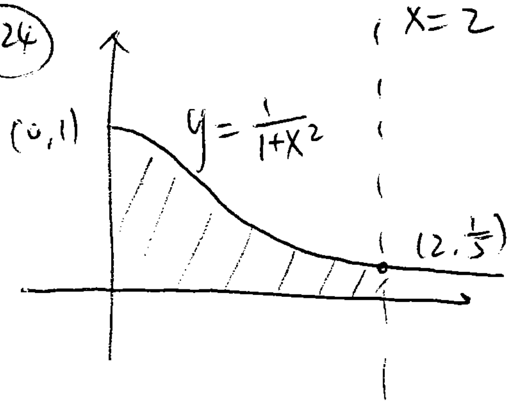
$$V = 2\pi \int_0^4 y \cdot (4y^2 - y^3)\, dy$$

$$= 2\pi \int_0^4 (4y^3 - y^4)\, dy$$

$$= 2\pi \left(y^4 - \frac{y^5}{5} \right)\Big|_0^4$$

$$= 2\pi \left(256 - \frac{1024}{5} \right) = \frac{512}{5}\pi$$

#24



$$V = \int_0^2 2\pi (2 - x)\left(\frac{1}{1+x^2} \right) dx$$