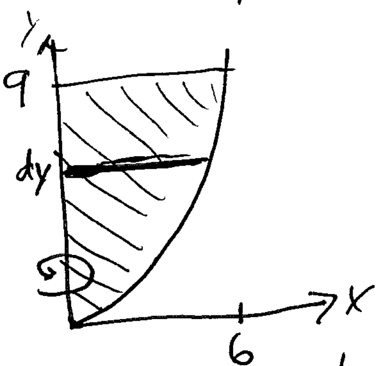
HW 7
MATH120

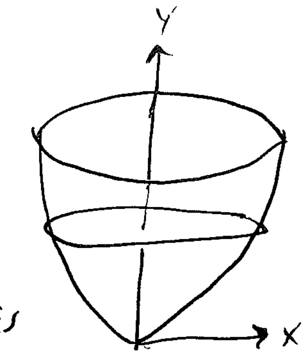
Sec 7.2 : # 3, 7, 13, 32
Sec 7.3 : # 2, 5, 11, 16

7.2.3

$x = \cancel{\sqrt{\;}}\, 2\sqrt{y} \Rightarrow y = \frac{x^2}{4}$



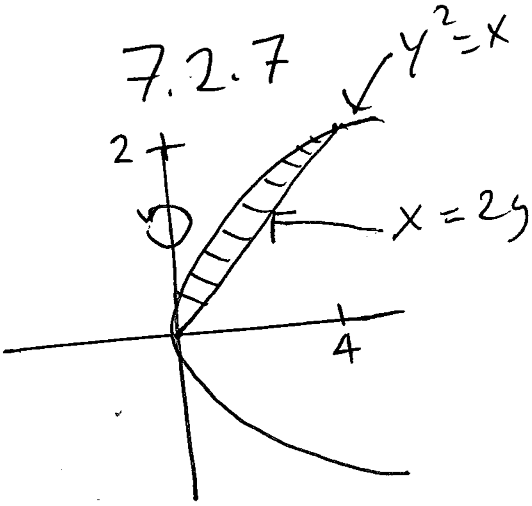
Area bounded by $y = \frac{x^2}{4}$, $y = 9$, $x = 0$ rotated about y-axis



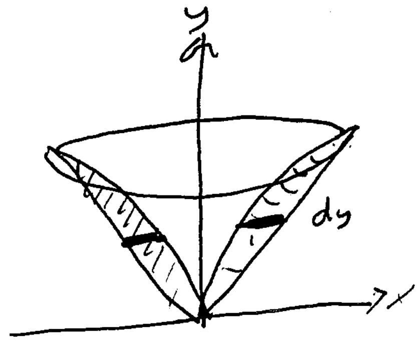
Disk Method

$$V = \int_0^9 \pi x^2\,dy = \int_0^9 4\pi y\,dy = \pi\, 2y^2\Big|_0^9 = \pi \cdot 2 \cdot 81 = 162\pi$$

7.2.7



WASHER method



$$V = \int_0^2 \pi (2y)^2 - \pi (y^2)^2\,dy = \pi \int_0^2 4y^2 - y^4\,dy = \pi\left(\frac{4y^3}{3} - \frac{y^5}{5}\right)$$

$$= \pi\left(\frac{4}{3}\cdot 8 - \frac{32}{5}\right) = \pi \cdot 32 \cdot \left(\frac{2}{15}\right) = \frac{64\pi}{15}$$

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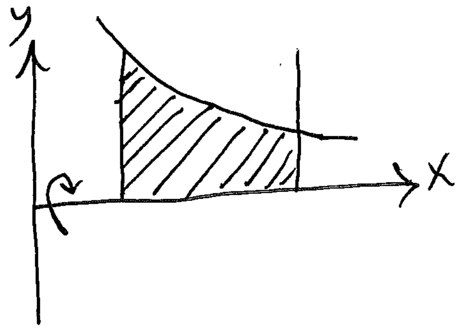
7.2.13 $y=\frac{1}{x}, x=1, x=2, y=0$ about x-axis



DISK METHOD

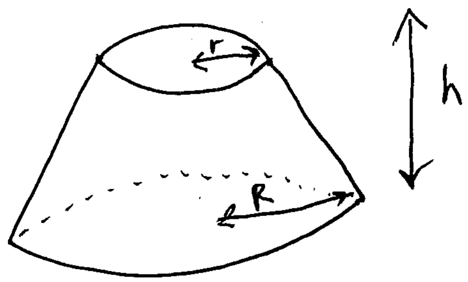
$$V=\int_1^2 \pi y^2\,dx = \pi\int_1^2 \left(\frac{1}{x}\right)^2 dx$$

$$=\pi\int_1^2 x^{-2}\,dx = \pi\left(-\frac{1}{x}\right)\Big|_1^2$$

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

$$=\frac{\pi}{2}$$

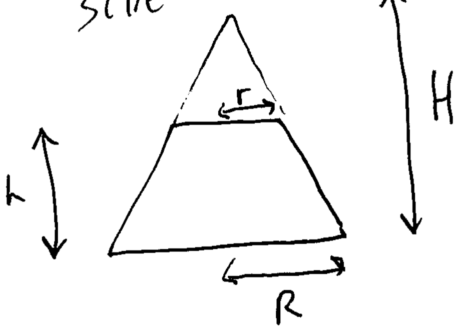
7.2.32



$$V=\frac{1}{3}\pi R^2H-\frac{1}{3}\pi r^2(H-h)$$

$$=\frac{1}{3}\pi R^2H-\frac{1}{3}\pi r^2H+\frac{1}{3}\pi r^2h$$

SIDE VIEW



Using Similar Triangles

$$\frac{r}{H-h}=\frac{R}{H} \Rightarrow rH=R(H-h)=RH-Rh$$

$$Rh=H(R-r)$$

$$\frac{Rh}{R-r}=H$$

$$V=\frac{1}{3}\pi\left[R^2\cdot\frac{Rh}{R-r}-\frac{r^2Rh}{R-r}+\cancel{\pi}r^2h\right]$$

$$=\frac{1}{3}\pi h\left[\frac{R^3-r^2R+r^2R-r^3}{R-r}\right]$$

$$=\frac{1}{3}\pi h\left(\frac{R^3-r^3}{R-r}\right)$$

$$=\frac{1}{3}\pi h(R-r)\left(\frac{R^2+Rr+r^2}{R-r}\right)$$

$$V=\frac{1}{3}\pi h(R^2+Rr+r^2)$$

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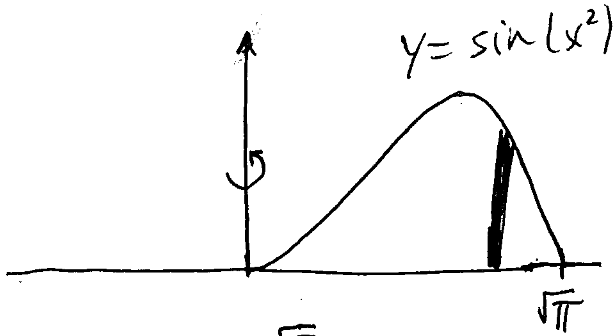
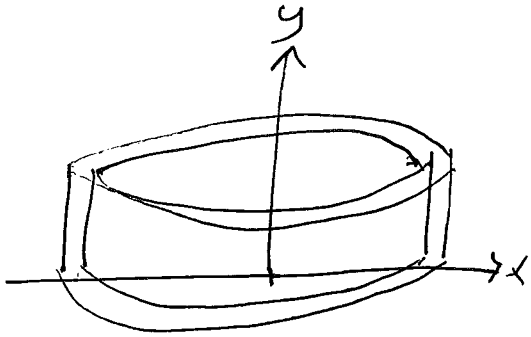
Sec 7.3.2





$$V=\int_0^{\sqrt{\pi}} 2\pi x\sin(x^2)\,dx = \pi\int_0^{\sqrt{\pi}} 2x\sin(x^2)\,dx$$

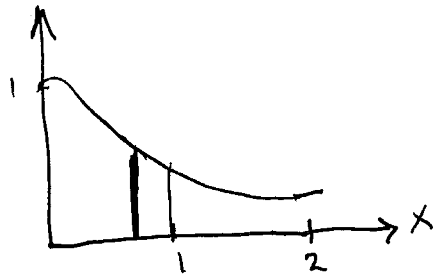
$u=x^2$ $du=2x\,dx$
$x=0, u=0$ $x=\sqrt{\pi}, u=\pi$

$$V=\pi\int_0^{\pi}\sin(u)\,du$$

$= -\pi\cos(u)\Big|_0^{\pi}$

$= -\pi[\cos\pi-\cos 0] = -\pi[-1-1] = -\pi\cdot -2 = 2\pi$

7.3.5.



$V=\int_0^1 2\pi x e^{-x^2}\,dx$

$= \pi(-e^{-x^2})\Big|_0^1 = \pi[(-e^{-1})-(-1$

$= \pi(1-\frac{1}{e})$

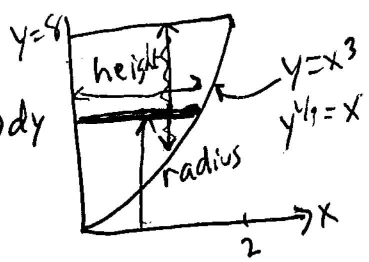
7.3.11

$V=\int_0^8 2\pi y(y^{1/3}-0)\,dy$

$= 2\pi\int_0^8 y^{4/3}\,dy$

$= 2\pi(\frac{3}{7}y^{7/3})\Big|_0^8 = 2\pi\cdot\frac{3}{7}\cdot 2^7 = \frac{3\pi}{7}\cdot 2^8$

$= \frac{768\pi}{7}$



$\cancel{V=\int_0^8 2\pi y(8-y^{1/3})\,dy = 2\pi\int_0^8 8y-y^{4/3}\,dy}$

$\cancel{= 2\pi(4y^2-\frac{3}{7}y^{7/3})\Big|_0^8}$

$\cancel{= 2\pi[4\cdot 8^2-\frac{3}{7}\cdot 2^7] = 2\pi[2\cdot 2^7-\frac{3}{7}\cdot 2}$

$\cancel{= \pi\cdot\frac{11}{7}\cdot 2^8 = \pi\cdot 2^8(2-\frac{3}{7})}$

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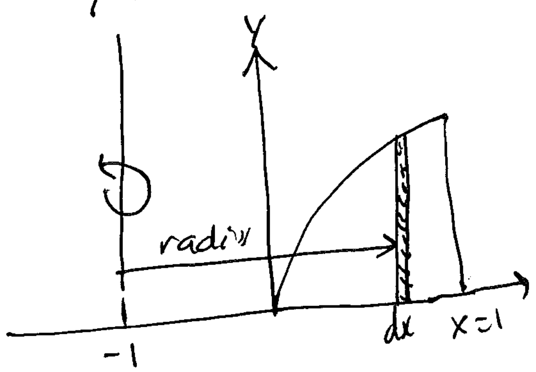
7.3.16



$$V = \int_0^1 2\pi(1+x)\sqrt{x}\,dx$$

$$= 2\pi \int_0^1 x^{1/2} + x^{3/2}\,dx$$

$$= 2\pi \left(\frac{2}{3}x^{3/2} + \frac{2x^{5/2}}{5}\right)\Bigg|_0^1$$

$$= 2\pi\left(\frac{2}{3}+\frac{2}{5}\right) = 4\pi\left(\frac{3}{15}+\frac{5}{15}\right)$$

$$= \frac{32\pi}{15}$$