#1)

(a) $\lim_{x\to 0} \dfrac{1-\cos x}{x^2+x}$ $\quad \dfrac{0}{0}$

$\overset{L'H}{=} \lim_{x\to 0} \dfrac{\sin x}{2x+1}$

$= \dfrac{0}{1}$

$= 0$

(b) $\lim_{x\to 0^+} x^2 \cdot \ln x$ $\quad 0 \cdot \infty$

$= \lim_{x\to 0^+} \dfrac{\ln x}{\frac{1}{x^2}}$ $\quad \dfrac{\infty}{\infty}$

$\overset{L'H}{=} \lim_{x\to 0^+} \dfrac{\frac{1}{x}}{-\frac{2}{x^3}}$

$= \lim_{x\to 0^+} -\dfrac{x^2}{2}$

$= 0$

#1 Continued

(c) $\frac{d}{dx}\left[\sqrt{x \cdot \ln(x^4)}\right]$

$$= \frac{1}{2}\left(x \cdot \ln(x^4)\right)^{-\frac{1}{2}} \cdot \left(x \cdot \frac{1}{x^4} \cdot 4x^3 + \ln(x^4)\right)$$

$$= \frac{1}{2}\left(x \cdot \ln(x^4)\right)^{-\frac{1}{2}}\left(4 + \ln(x^4)\right)$$

$$= \frac{1}{2}\left(\frac{4 + 4\ln x}{\sqrt{x \cdot \ln(x^4)}}\right)$$

$$= \frac{2 + 2\ln x}{\sqrt{4x \cdot \ln x}}$$

$$= \frac{2 + 2\ln x}{2\sqrt{x \cdot \ln x}}$$

$$= \frac{1 + \ln x}{\sqrt{x \cdot \ln x}}$$

#1 Continued

Let $u = 1 + 2x$

$du = 2\,dx$

$\frac{1}{2}du = dx$

$x = \frac{u-1}{2}$

New Limits

$u(4) = 9$

$u(0) = 1$

(d) $\displaystyle\int_0^4 \frac{x}{\sqrt{1+2x}}\,dx$

$\displaystyle = \frac{1}{2}\int_1^9 \frac{\frac{u-1}{2}}{u^{1/2}}\,du$

$\displaystyle = \frac{1}{2}\int_1^9 \frac{u-1}{2u^{1/2}}\,du$

$\displaystyle = \frac{1}{4}\int_1^9 \left(u^{\frac{1}{2}} - u^{-\frac{1}{2}}\right)du$

$\displaystyle = \frac{1}{4}\left[\frac{2}{3}u^{\frac{3}{2}} - 2u^{\frac{1}{2}}\right]_1^9$

$\displaystyle = \frac{1}{4}\left[\left(\frac{2}{3}(9)^{\frac{3}{2}} - 2(9)^{\frac{1}{2}}\right) - \left(\frac{2}{3}(1)^{\frac{3}{2}} - 2(1)^{\frac{1}{2}}\right)\right]$

$\displaystyle = \frac{1}{4}\left[18 - 6 - \frac{2}{3} + 2\right]$

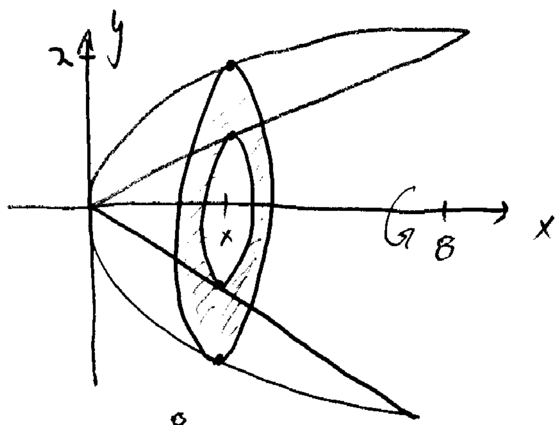
$\displaystyle = \frac{1}{4}\left(\frac{40}{3}\right)$

$\displaystyle = \frac{10}{3}$

#2

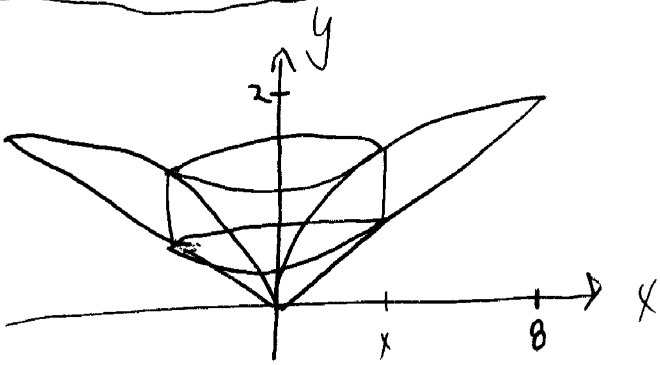
(a) $A = \int_0^8 \left(\sqrt[3]{x} - \frac{1}{4}x \right) dx$ units^2

(b)



$V = \pi \int_0^8 \left[\left(\sqrt[3]{x}\right)^2 - \left(\frac{1}{4}x\right)^2 \right] dx$ units^3

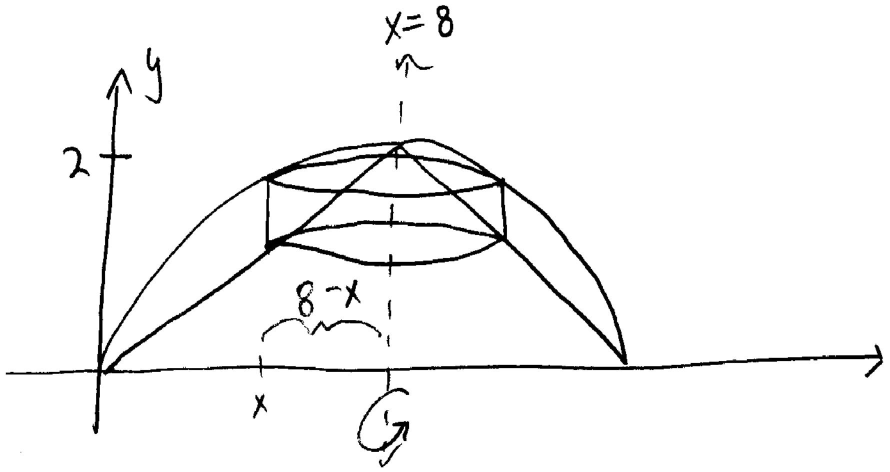
(c)



$V = 2\pi \int_0^8 x \left(\sqrt[3]{x} - \frac{1}{4}x \right) dx$ units^3

#2) Continued

(d)



Shells

$V = 2\pi \int_0^8 (8-x)\left(\sqrt[3]{x} - \frac{1}{4}x\right)dx$ units^3

#3) CAS

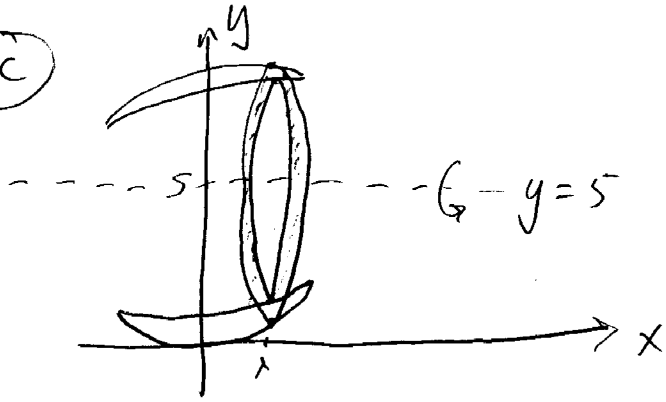
(a) First Point (2, 4)   Second Point (4, 16)   Third Point (-.767, .588)

(b) $R_1 + R_2 = \int_{-.767}^{2} (2^x - x^2)\,dx + \int_2^4 (x^2 - 2^x)\,dx$

$\overset{CAS}{\approx} 3.460$

#3 continued

(c)

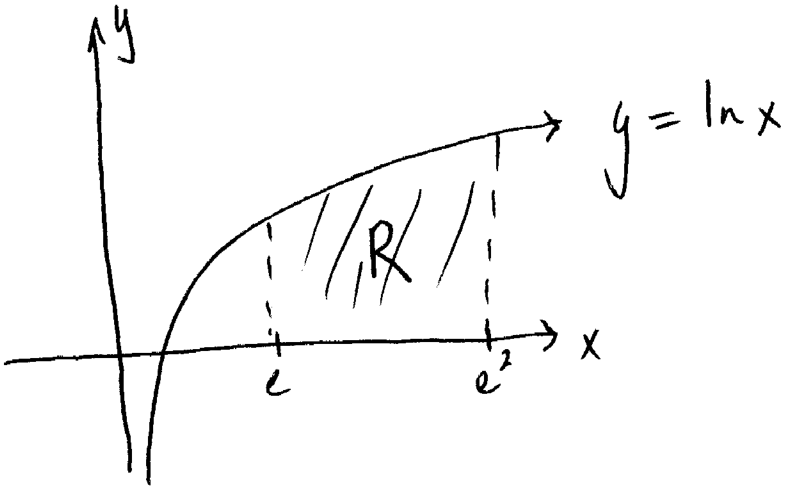


Washers

$$V = \pi \int_{-.767}^{2} \left[(5 - x^2)^2 - (5 - 2^x)^2 \right] dx$$

$V \overset{calc}{\approx} 50.956 \text{ units}^3$

#4)



a) $L = \int_e^{e^2} \sqrt{1 + (y')^2}\, dx$

$\overset{CAS}{=} \ln\left[\dfrac{\sqrt{e^4+1} - 1}{\sqrt{e^2+1} - 1}\right] + \sqrt{e^4+1} - \sqrt{e^2+1} - 1$ units

b) $A = \int_e^{e^2} \ln x \, dx$

$\overset{CAS}{=} e^2$ units^2

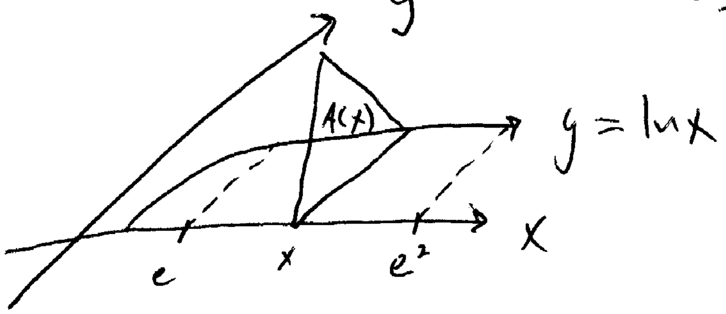
c) Solve the equation

$$\int_{e^1}^{K} \ln x \, dx = \int_K^{e^2} \ln x \, dx$$

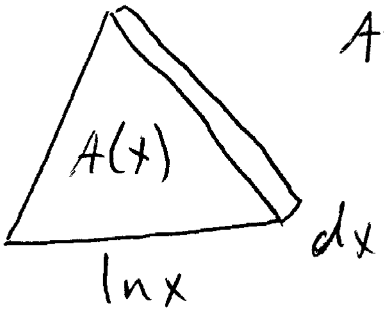
$$K \overset{CAS}{\approx} 5.393$$

#4) Continued

d)



Equilateral Triangle



$A = \frac{\sqrt{3}}{4} s^2$

$$V = \frac{\sqrt{3}}{4} \int_e^{e^2} (\ln x)^2 \, dx$$

$$A(x) = \frac{\sqrt{3}}{4} (\ln x)^2$$

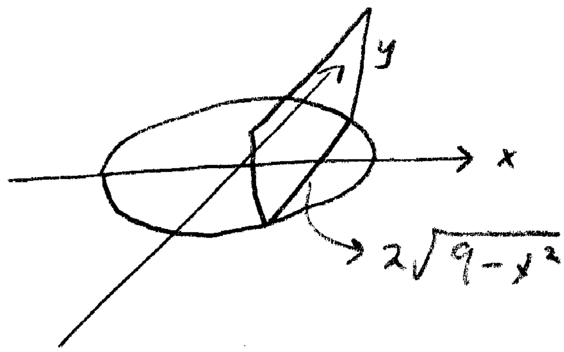
$$\underset{=}{\text{CAS}} \quad \frac{e(2e-1)\sqrt{3}}{4} \text{ units}^3$$

#5)

(a) $x^2+y^2=3^2$

$y^2=9-x^2$

$y=\pm\sqrt{9-x^2}$



$A(x)=\left(2\sqrt{9-x^2}\right)^2=4(9-x^2)=36-4x^2$

(b) $V=2\cdot\int_0^3(36-4x^2)\,dx$

(c) $V\overset{CAS}{=}144$ units^3

#6)

(a) $\Delta x=\frac{4-2}{10}=\frac{1}{5}=.2$, $f(x)=\frac{e^x}{x}$, $n=10$

$M_{10}=\frac{1}{5}\big(f(2.1)+f(2.3)+f(2.5)+f(2.7)+f(2.9)+$
$f(3.1)+f(3.3)+f(3.5)+f(3.7)+f(3.9)\big)$

$M_{10}\overset{CAS}{=}14.662669$

(b) $T_{10}=\frac{\Delta x}{2}\big(f(2)+2f(2.2)+2f(2.4)+2f(2.6)+2f(2.8)+$
$2f(3.0)+2f(3.2)+2f(3.4)+2f(3.6)+$
$2f(3.8)+f(4)\big)$

$T_{10}\overset{CAS}{=}14.704592$

#6) Continued

(c) $S_{10} = \frac{\Delta x}{3}\Big(f(2)+4\cdot f(2.2)+2\cdot f(2.4)+4\cdot f(2.6)+2\cdot f(2.8)+4\cdot f(3)$

$+2\cdot f(3.2)+4\cdot f(3.4)+2\cdot f(3.6)+4\cdot f(3.8)+f(4)\Big)$

$S_{10} \overset{CAS}{=} 14,676696$

$\int_2^4 \frac{e^x}{x}\,dx \overset{CAS}{\approx} 14.676640$

Voyage 200 Answer

Good Luck!!