Sec 5.4 p336 #16

$$\int_0^{\pi/6} (\sec x + \tan x)^2 dx = \int_0^{\pi/6} \sec^2 x + 2\sec x \tan x + \tan^2 x \, dx$$

$$= \int_0^{\pi/6} \sec^2 x + 2\sec x \tan x + \sec^2 x - 1 \, dx$$

$$= \int_0^{\pi/6} 2\sec^2 x + 2\sec x \tan x - 1 \, dx$$

$$= 2\tan x + 2\sec x - x \Big|_0^{\pi/6}$$

$$= 2\left(\frac{1}{\sqrt{3}} - 0\right) + 2\left(\frac{2}{\sqrt{3}} - 1\right) - \frac{\pi}{6}$$

$$= \frac{6}{\sqrt{3}} - 2 - \frac{\pi}{6} = 2\sqrt{3} - 2 - \frac{\pi}{6}.$$

Sec 5.4 p336 #20

$$\int_{-\sqrt{3}}^{\sqrt{3}} (t+1)(t^2+4) \, dt = \int_{-\sqrt{3}}^{\sqrt{3}} t^3 + t^2 + 4t + 4 \, dt$$

$$= \frac{1}{4}t^4 + \frac{1}{3}t^3 + 2t^2 + 4t \Big|_{-\sqrt{3}}^{\sqrt{3}}$$

$$= \frac{2}{3}(\sqrt{3})^3 + 8\sqrt{3} = 2\sqrt{3} + 8\sqrt{3} = 10\sqrt{3}$$

Sec 5.4 p336 #52

$$y = \int_{\tan x}^{0} \frac{dt}{1+t^2}, \quad \frac{dy}{dt} = -\frac{1}{1+\tan^2 x} \cdot \sec^2 x = -\frac{\sec^2 x}{\sec^2 x} = -1.$$

(Note: by integration, $y = -x$)

Sec 5.4 p 336 #62

$\sin\frac{\pi}{6} = \sin\frac{5\pi}{6} = \frac{1}{2}$, so the horizontal line is $y = \frac{1}{2}$.

The area is $\displaystyle\int_{\pi/6}^{5\pi/6} \sin x - \frac{1}{2}\,dx = -\cos x - \frac{1}{2}x \Big|_{\pi/6}^{5\pi/6}$

$$= -\left(-\frac{\sqrt{3}}{2} - \frac{\sqrt{3}}{2}\right) - \frac{1}{2}\left(\frac{5\pi}{6} - \frac{\pi}{6}\right)$$

$$= \sqrt{3} - \frac{\pi}{3}.$$

Sec 5.4 p 336 # 78

$$\int_0^x f(t)\,dt = x\cos\pi x$$

Take $\frac{d}{dx}$ of both sides:

$$f(x) = \cos\pi x - \pi x\sin\pi x$$

So $f(4) = \cos 4\pi - 4\pi\sin 4\pi$
$= 1.$

Sec 5.4 p 336 #84

$$\lim_{x\to\infty} \frac{1}{\sqrt{x}} \int_1^x \frac{dt}{\sqrt{t}} \overset{L'H}{=} \lim_{x\to\infty} \frac{1/\sqrt{x}}{\cancel{1}/2\sqrt{x}} = \frac{1}{1/2} = 2.$$

(!!)

Sec 5.5 p 345 #24

$$\int \tan^2 x \underline{\sec^2 x\,dx} = \int u^2\,du = \frac{u^3}{3} + C = \frac{\tan^3 x}{3} + C.$$

$u = \tan x$

$du = \sec^2 x\,dx$

Sec 5.5 p345 #36

$$\int \frac{\cos\sqrt{\theta}}{\sqrt{\theta}\,\sin^2\sqrt{\theta}}\,d\theta = 2\int \frac{\cos u}{\sin^2 u}\,du = 2\int \frac{1}{v^2}\,dv = -\frac{2}{v} + C$$

$$= -\frac{2}{\sin u} + C$$

$$= \frac{-2}{\sin\sqrt{\theta}} + C$$

Two steps: $u = \sqrt{\theta}$, $du = \frac{1}{2\sqrt{\theta}}\,d\theta$

$v = \sin u$

$dv = \cos u\,du$

Sec 5.5 p345 # 54

$$\int \frac{1}{x^2} e^{1/x} \sec(1+e^{1/x}) \tan(1+e^{1/x})\,dx = -\int \sec u \tan u\,du$$

$u = 1 + e^{1/x}$

$du = -\frac{1}{x^2} e^{1/x}\,dx$

$$= -\sec u + C$$

$$= -\sec(1+e^{1/x}) + C$$

Sec 5.5 p345 # 80

accel: $s'' = \pi^2 \cos \pi t$ $\qquad s(0) = 0$ $\qquad$ (units: meters, seconds)

$v(0) = 8 = s'(0)$

$$s'(t) = 8 + \int_0^t s''(\square)\,d\square = 8 + \int_0^t \pi^2 \cos \pi\square\,d\square$$

$$= 8 + \pi \sin \pi t$$

$$s(t) = 0 + \int_0^t (8 + \pi \sin \pi\square)\,d\square = 8t - \cos \pi t + 1.$$

$$s(1) = 8 - (-1) + 1 = 10$$

Sec 5.6 p 353 # 30

$$\int_2^4 \frac{dx}{x\ln x} = \int_{\ln 2}^{\ln 4} \frac{du}{u} = \ln u \Big|_{\ln 2}^{\ln 4} = \ln(\ln 4) - \ln(\ln 2).$$

$u = \ln x$

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

$$= \ln\left(\frac{\ln 4}{\ln 2}\right) = \ln\left(\frac{2\ln 2}{\ln 2}\right)$$

$$= \ln 2.$$

Sec 5.6 p 353 # 40

$$\int_1^{e^{\pi/4}} \frac{4\,dt}{t(1+\ln^2 t)} = \int_0^{\pi/4} \frac{4\,du}{1+u^2} = 4\arctan u\Big|_0^{\pi/4} = \underline{4\arctan\tfrac{\pi}{4}}$$

$u = \ln t$

$du = \frac{1}{t}dt$

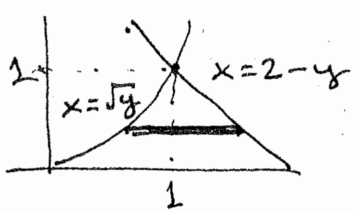
Sec 5.6 p 353 # 48

$$A = \int_0^{\pi} (1-\cos x)\sin x\,dx = \int_0^2 u\,du = \tfrac{1}{2}u^2\Big|_0^2 = 2.$$

$u = 1-\cos x$

$du = \sin x\,dx$

Sec 5.6 p 353 # 58



$$A = \int_0^1 2-y-\sqrt{y}\,dy = 2y-\tfrac{1}{2}y^2-\tfrac{2}{3}y^{3/2}\Big|_0^1$$

$$= 2-\tfrac{1}{2}-\tfrac{2}{3} = \tfrac{5}{6}.$$

Sec 5.6 p353 # 68

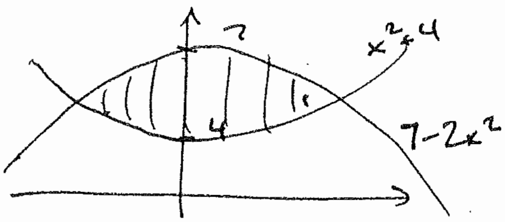
$y = 7-2x^2$

$y = x^2+4$

intersection: $7-2x^2 = x^2+4$

$3 = 3x^2$

$x = \pm 1.$



$$A = \int_{-1}^{1} 7-2x^2 - (x^2+4)\,dx$$

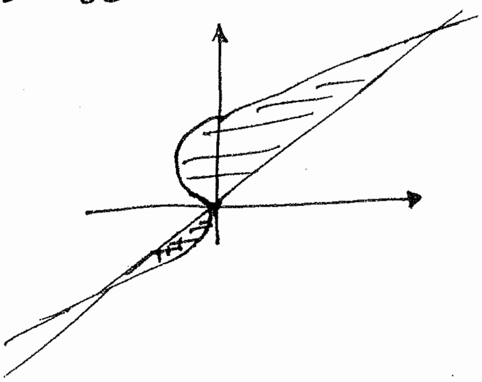
$$= \int_{-1}^{1} 3-3x^2\,dx = 3x - x^3 \Big|_{-1}^{1}$$

$$= 6-2 = \underline{4.}$$

Sec 5.6 p353# 80

$x = y^3 - y^2$

$x = 2y$



intersection:

$y^3 - y^2 = 2y$

$y(y^2-y-2) = 0$

$y(y-2)(y+1) = 0$

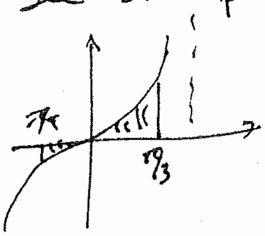
$y = 0, 2, -1$

$$A = \int_{-1}^{0} y^3-y^2-2y\,dy + \int_{0}^{2} 2y-(y^3-y^2)\,dy$$

$$= \frac{1}{4}y^4 - \frac{1}{3}y^3 - y^2 \Big|_{-1}^{0} + y^2 - \frac{1}{4}y^4 + \frac{1}{3}y^3 \Big|_{0}^{2}$$

$$= -\frac{1}{4} - \frac{1}{3} + 1 \quad + \quad 4 - 4 + \frac{8}{3} = \frac{37}{12}$$

Sec 5.6 p353 #98



$$A = \int_{-\pi/4}^{0} -\tan x\,dx + \int_{0}^{\pi/3} \tan x\,dx$$

$$= \ln\cos x \Big|_{-\pi/4}^{0} - \ln\cos x \Big|_{0}^{\pi/3}$$

$$= \ln 1 - \ln \tfrac{\sqrt{2}}{2} - \ln \tfrac{1}{2} + \ln 0 = -\ln\frac{\sqrt{2}}{4} = \underline{\ln 2\sqrt{2}}.$$

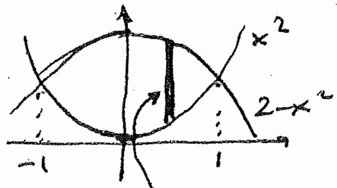
Now: $\int \tan x\,dx = \int \frac{\sin x}{\cos x}\,dx$

$u = \cos x$ $\quad \doteq \int -\frac{du}{u}$

$du = -\sin x$ $\quad = \ln u + C$

$= -\ln\cos x + C.$

Sec 6.1 p373 #2



$\Rightarrow$ Volume of one slice $= \pi(1-x^2)^2 dx$

$\Rightarrow$ total volume $= \int_{-1}^{1} \pi (1-x^2)^2 dx$

diameter of disk $= 2-x^2-x^2 = 2-\cancel{2}x^2$

radius of disk $= 1-x^2$

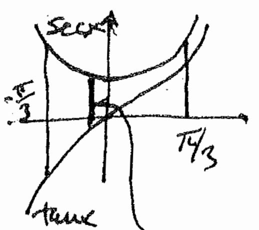
area of disk $= \pi(1-x^2)^2$

$= \pi \int_{-1}^{1} 1-2x^2+x^4\, dx$

$= \pi\left(x-\frac{2}{3}x^3+\frac{1}{5}x^5\right)\Big|_{-1}^{1}$

$= \pi\left(2-\frac{4}{3}+\frac{2}{5}\right) = \underline{\frac{16\pi}{15}}$.

Sec 6.1 p373 #6



part (a): diameter of disk
part (b): side of square $\Big\}$ = sec x − tan x

(a) radius of disk $= \frac{1}{2}(\sec x - \tan x)$

area of disk $= \frac{\pi}{4}(\sec x - \tan x)^2$

Volume of one slice $= \frac{\pi}{4}(\sec x - \tan x)^2 dx$

Total volume $= \int_{-\pi/3}^{\pi/3} \frac{\pi}{4}(\sec^2 x - 2\sec x\tan x + \tan^2 x)dx$

$= \frac{\pi}{4}\int_{-\pi/3}^{\pi/3} \sec^2 x - 2\sec x \tan x + \sec^2 x - 1\; d$

$= \frac{\pi}{4}\int_{-\pi/3}^{\pi/3} 2\sec^2 x - 2\sec x\tan x - 1\, dx = \frac{\pi}{4}(2\tan x - 2\sec x -$

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

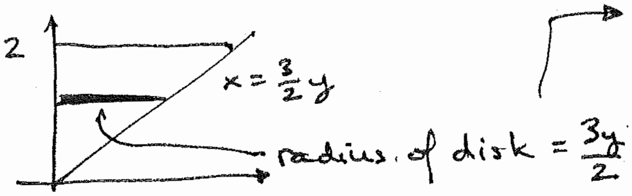
(b) side of square = sec x − tan x

area of square $= (\sec x - \tan x)^2$

Vol of one slice $= (\sec x - \tan x)^2 dx$

Total volume $= \int_{-\pi/3}^{\pi/3} (\sec x - \tan x)^2 dx = 2\tan x - 2\sec x - x\Big|_{-\pi/3}^{\pi/3} = 4\sqrt{3} - \frac{2\pi}{3}$

Sec 6.1 p373 #16

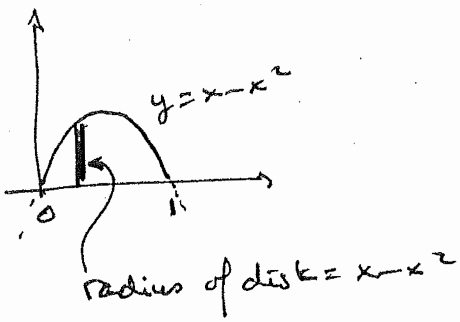


Volume of one disk $= \pi\left(\frac{3y}{2}\right)^2 dy$

Total volume $= \int_0^2 \pi \frac{9}{4} y^2 dy = \frac{3}{4}\pi y^3 \Big|_0^2$

$= \underline{6\pi}$.

Sec 6.1 p373 #22



Volume of one disk $= \pi(x-x^2)^2 dx$

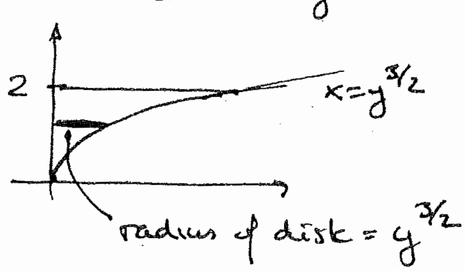
Total volume $= \int_0^1 \pi(x^2 - 2x^3 + x^4)\,dx$

$= \pi\left(\frac{1}{3}x^3 - \frac{1}{2}x^4 + \frac{1}{5}x^5\right)\Big|_0^1$

$= \pi\left(\frac{1}{3} - \frac{1}{2} + \frac{1}{5}\right) = \frac{\pi}{30}$.

Sec 6.1 p373 #32

$x = y^{3/2}$ $\quad x = 0$ $\quad y = 2$
around y-axis

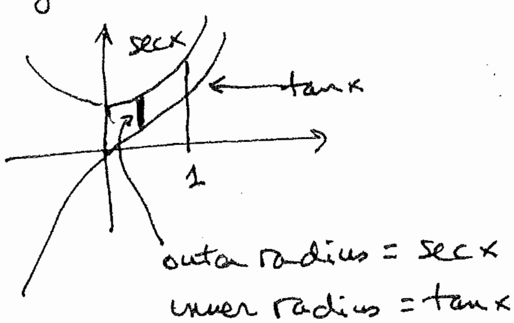


Volume of one disk $= \pi y^3 dy$

Total volume $= \int_0^2 \pi y^3 dy = \frac{\pi}{4} y^4 \Big|_0^2 = 4\pi$

Sec 6.1 p373 #44

$y = \sec x$ $\quad y = \tan x$ $\quad x = 0$ $\quad x = 1$ $\quad$ around x-axis



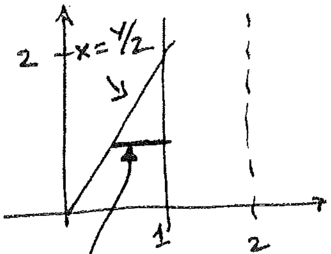
Volume of one washer $= \pi \sec^2 x\,dx - \pi \tan^2 x\,dx$

Total volume $= \int_0^1 \pi(\sec^2 x - \tan^2 x)\,dx$

$= \int_0^1 \pi(\sec^2 x - (\sec^2 x - 1))\,dx$

$= \int_0^1 \pi\,dx = \underline{\underline{\pi}}$

Sec 6.1 p373 #52



around $x=1$, radius of disk is $1-y/2$

around $x=2$, outer radius is $2-y/2$
inner radius is 1

(a) Vol of one disk $= \pi\left(1-\frac{y}{2}\right)^2 dy$

$$\text{Total volume} = \int_0^2 \pi\left(1-y+\tfrac{1}{4}y^2\right)dy$$

$$= \pi\left(y-\tfrac{1}{2}y^2+\tfrac{1}{12}y^3\right)\Big|_0^2$$

$$= \pi\left(2-2+\tfrac{8}{12}\right) = \frac{2\pi}{3}.$$

(b) Vol of one washer:

$$\pi\left(2-\tfrac{y}{2}\right)^2 dy - \pi(1)^2 dy$$

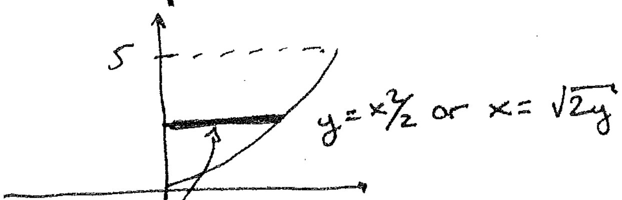
$$\text{Total volume} = \int_0^2 \pi\left[\left(2-\tfrac{y}{2}\right)^2-1\right]dy$$

$$= \int_0^2 \pi\left(4-2y+\tfrac{1}{4}y^2-1\right)dy$$

$$= \pi\left(3y-y^2+\tfrac{1}{12}y^3\right)\Big|_0^2 = \pi\left(2+\tfrac{2}{3}\right)$$

$$= \frac{8\pi}{3}.$$

Sec 6.1 p373 #56



radius of disk $= \sqrt{2y}$

Vol of one disk $= \pi \cdot 2y\,dy$

(a) Vol of bowl $= \int_0^5 \pi\cdot 2y\,dy = \pi y^2\Big|_0^5 = 25\pi$

(b) Vol of water up to height h:

$$V(h) = \int_0^h 2\pi y\,dy \Rightarrow \frac{dV}{dh} = 2\pi h.$$

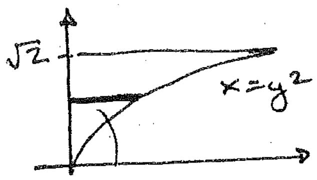
$$\Rightarrow \frac{dV}{dt} = 2\pi h\frac{dh}{dt}.$$

If $\frac{dV}{dt} = 3$, then when $h=4$:

$$3 = 2\pi(4)\frac{dh}{dt}$$

$$\Rightarrow \frac{dh}{dt} = \frac{3}{8\pi}\ \frac{\text{units}}{\text{sec}}$$

Sec 6.2 p381 #3



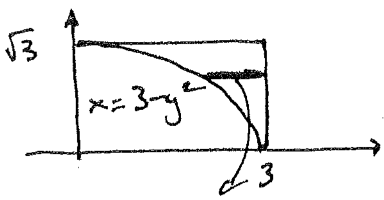
Total volume $= \int_0^{\sqrt{2}} 2\pi y^3\,dy = \frac{\pi}{2} y^4 \Big|_0^{\sqrt{2}} = \underline{\underline{2\pi}}$

radius of shell $= y$

"height" of shell $= y^2$

Volume of one shell $= 2\pi y (y^2)\,dy$

Sec 6.2 p381 #4



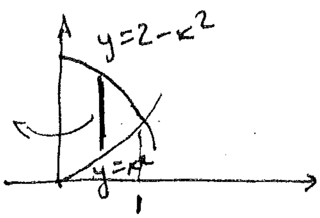
Total volume $= \int_0^{\sqrt{3}} 2\pi y^3\,dy = \frac{\pi}{2} y^4 \Big|_0^{\sqrt{3}} = \underline{\underline{\frac{9\pi}{2}}}$

radius of shell $= y$

"height" of shell $= 3-(3-y^2) = y^2$

Volume of one shell $= 2\pi y (y^2)\,dy$

Sec 6.2 p381 #10



Total volume $= \int_0^1 2\pi (2x-2x^3)\,dx$

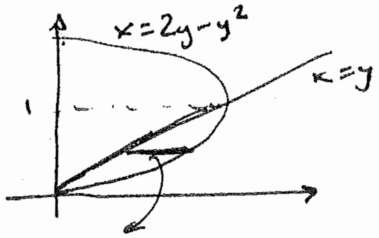
$= 2\pi \left(x^2 - \frac{1}{2}x^4\right) \Big|_0^1 = \underline{\underline{\pi}}$

radius of shell $= x$

height of shell $= 2-x^2-x^2 = 2-2x^2$

Volume of one shell $= 2\pi x (2-2x^2)\,dx$

Sec 6.2 p381 #18



Total volume $= \int_0^1 2\pi(y^2-y^3)\,dy$

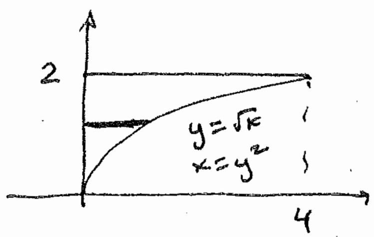
$= 2\pi\left(\frac{1}{3}y^3 - \frac{1}{4}y^4\right)\Big|_0^1 = \frac{\pi}{6}.$

radius of shell $= y$

"height" of shell $= 2y-y^2-y = y-y^2$

Volume of one shell $= 2\pi y(y-y^2)$

Sec 6.2 p381 #32



(a) Around the x-axis: Shells.

radius of shell $= y$

"height" of shell $= y^2$

Volume of one shell $= 2\pi y(y^2)$

Total volume $= \int_0^2 2\pi y^3\,dy = \frac{\pi}{2}y^4\Big|_0^2 = 8\pi$

(b) Around the y-axis: Disks!

radius of disk $= y^2$

Volume of one disk: $\pi(y^2)^2dy = \pi y^4 dy$

Total volume $= \int_0^2 \pi y^4\,dy = \frac{\pi}{5}y^5\Big|_0^2 = \frac{32\pi}{5}$

(c) Around $x=4$ – Washers.

outer radius $= 4$

inner radius $= 4-y^2$

Vol. of one washer $= (\pi 4^2 - \pi(4-y^2)^2)\,dy$

Total volume $= \int_0^2 \pi\left(16-[16-8y^2+y^4]\right)dy$

$= \int_0^2 \pi(8y^2-y^4)\,dy = \pi\left(\frac{8}{3}y^3 - \frac{1}{5}y^5\right)\Big|$

$= \pi\left(\frac{64}{3} - \frac{32}{5}\right) = 32\pi\left(\frac{10}{15} - \frac{3}{15}\right) = \frac{224\pi}{15}$

(d) Around $y=2$: Shells

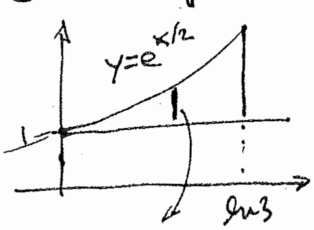
radius of shell $= 2-y$

"height" of shell $= y^2$

Volume of one shell $= 2\pi(2-y)y^2\,dy$

Total volume $= \int_0^2 2\pi(2y^2-y^3)\,dy = 2\pi\left(\frac{2}{3}y^3 - \frac{1}{4}y^4\right)\Big|_0^2 = 2\pi\left(\frac{16}{3} - \frac{16}{4}\right) = \frac{8\pi}{3}.$

Sec 6.2 p381 #48



Washers: outer radius $= e^{x/2}$

inner radius $= 1$

Volume of one washer $= \pi\left((e^{x/2})^2 - 1^2\right)dx$

$= \pi(e^x - 1)\,dx$

Total volume $= \int_0^{\ln 3} \pi(e^x-1)\,dx$

$= \pi(e^x - x)\Big|_0^{\ln 3}$

$= \pi(3-\ln 3 - (1-0))$

$= \pi(2-\ln 3).$

Math 104
Hand in HW 2

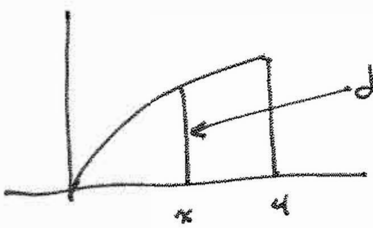
Name____________________
Recit. # __________

Spring 2016 LPS

1. The base of a solid is a the region between the x – axis, $y = \sqrt{x}$, $x = 4$, Each cross section perpendicular to the x – axis is a semicircle with diameter running along the base. Find the volume.

(A) $\sqrt{2}$ (C) $2\sqrt{3}$ (E) $\frac{5\pi}{6}$ (G) π

(B) $\frac{\pi}{9}$ (D) $\frac{\pi}{6}$ (F) $\frac{\pi}{2}$ (H) $\frac{\pi}{4}$



diam $= \sqrt{x}$

Area of semicircle $= \frac{1}{2}\pi\left(\frac{\sqrt{x}}{2}\right)^2 = \frac{\pi x}{8}$.

$$V = \int_0^4 \frac{\pi}{8} x \, dx = \frac{\pi}{16} x^2 \Big|_0^4 = \pi \quad (G)$$

Math 104 Name______________________

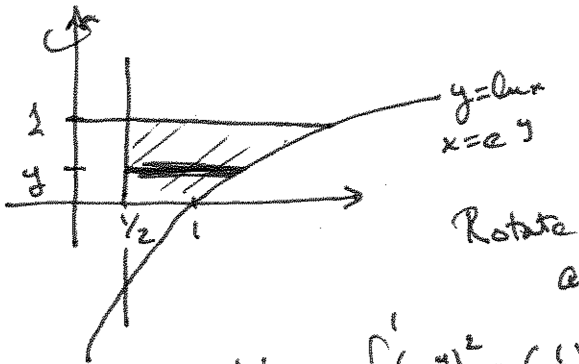
Hand in HW 2 Recit. # ____________

Fall 2010

3. Find the volume of the solid obtained by rotating the region bounded by the x-axis, the line $y = 1$, the curve $y = \ln(x)$, and the line $x = 1/2$ about the y-axis.

(A) $\pi(e-2)$ (B) $2\pi\left(\frac{e^2}{4}-\frac{3}{4}\right)$ (C) $2\pi\left(\frac{e^2}{4}+\frac{3}{4}\right)$ (D) $\pi\left(\frac{1}{2}e^2-\frac{3}{4}\right)$

(E) $\frac{\pi}{8}(4e^2-3-2\ln 2)$ (F) $\pi\left(e-\frac{3}{2}\right)$ (G) $\frac{e\pi}{2}$ (H) $\pi\left(\frac{3}{4}+\frac{e^2}{2}-e\right)$



Because of the shape of the region, it is easier to use horizontal sections. Rotate a horizontal slice around the y-axis and get a washer.

$$V = \pi \int_0^1 (e^y)^2 - \left(\tfrac{1}{2}\right)^2 dy = \pi \int_0^1 e^{2y} - \tfrac{1}{4}\, dy$$

$$= \pi\left(\tfrac{1}{2}e^{2y} - \tfrac{1}{4}y\right)\Big]_0^1 = \pi\left(\tfrac{1}{2}e^2 - \tfrac{1}{2} - \tfrac{1}{4}\right)$$

$$= \pi\left(\tfrac{1}{2}e^2 - \tfrac{3}{4}\right) \quad (D)$$

Math 104
Hand in HW 2

Name________________________

Recit. # ______________

Spring 2014 # 1

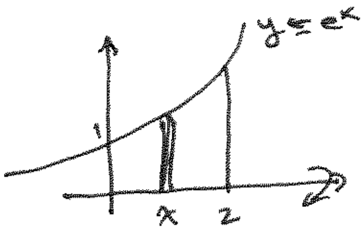
1. Find the volume of the solid generated by revolving the region bounded by the graphs of $y = e^x$, $y = 0$, $x = 0$, and $x = 2$ about the line $x-$axis.

(A) $\frac{\pi}{4}e^2$ (E) $\frac{\pi}{2}(e^4 - 1)$

(B) $\frac{\pi}{2}e^4$ (F) $2\pi(e^4 - 1)$

(C) $2\pi e^2$ (G) $2\pi e^4$

(D) $\frac{\pi}{4}e$ (H) 2π



Use vertical sections

Rotate a vertical slice around the x-axis to get a disk

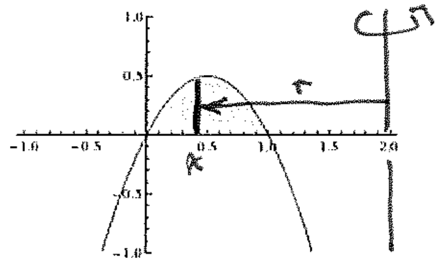
$$V = \pi \int_0^2 (e^x)^2 dx = \pi \int_0^2 e^{2x} dx = \frac{\pi}{2} e^{2x} \Big|_0^2 = \frac{\pi}{2}(e^4 - 1) \quad (E)$$

Math 104 Name________________________

Hand in HW 2 Recit. # ____________

Spring 2014 # 2

2. Find the volume of the solid generated by revolving the region bounded above by the graph of $y = 2x - 2x^2$ and below by the x-axis about the line $x = 2$.



(A) $\frac{\pi}{4}$ (E) $\frac{\pi}{3}$

(B) $\frac{\pi}{6}$ (F) $\frac{\pi}{2}$

(C) $\frac{2\pi}{3}$ (G) 2π

(D) $\frac{3\pi}{4}$ (H) π

Use vertical sections. Rotate vertical section around the vertical line $x=2$ and get a cylindrical shell.

$$V = 2\pi \int r\,h\,dx = 2\pi \int_0^1 (2-x)(2x-2x^2)\,dx$$

$$= 2\pi \int_0^1 4x \underline{- 4x^2 - 2x^2} + 2x^3\,dx$$

$$= 2\pi \left[2x^2 - 2x^3 + \tfrac{1}{2}x^4\right]_0^1 = \pi \quad \text{(H).}$$

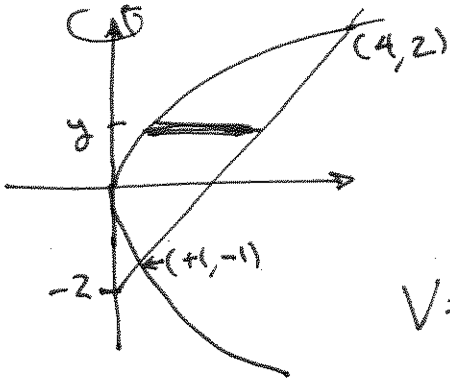
Math 104 Name____________________

Hand in HW 2 Recit. # __________

Fall 2008

2. The volume of the solid generated by revolving the region bounded by the curves $x = y^2$ and $y = x - 2$ about the y-axis

a) $\frac{20\pi}{3}$ b) $\frac{72\pi}{5}$ c) $\frac{42\pi}{5}$ d) $\frac{13\pi}{2}$ e) $\frac{32\pi}{5}$ f) $\frac{212\pi}{15}$



Because of the shape of the region use <u>horizontal</u> sections. Rotate a horizontal slice around the y-axis and get a <u>washer</u>.

$$V = \pi \int_{-1}^{2} (y+2)^2 - (y^2)^2 \, dy = \pi \int_{-1}^{2} (y+2)^2 - y^4 \, dy$$

$$= \pi \left[\tfrac{1}{3}(y+2)^3 - \tfrac{1}{5} y^5 \right]_{-1}^{2}$$

$$= \pi \left[\tfrac{1}{3}(64-1) - \tfrac{1}{5}(32+1) \right] = \pi \left[21 - \tfrac{33}{5} \right]$$

$$= \pi \left[\frac{105-33}{5} \right] = \frac{72\pi}{5} \quad (B)$$

Math 104 Name________________________

Hand in HW 2 Recit. # ____________

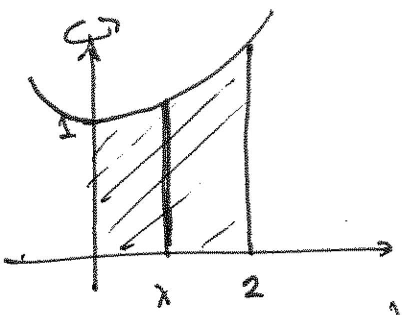
Spring 2007

2. Find the volume of the solid obtained by rotating the region bounded by the curves

$y = e^{x^2}$ and $y = 0$ and $x = 0$ and $x = 2$

about the y-axis.

A.) $4\pi e^4$ B.) $2\pi e^4$ C.) $2\pi(e^4 - 1)$ D.) $\pi(e^4 - 1)$ E.) $\pi\sqrt{e}$ F.) πe



Use vertical sections

Rotate a vertical slice around the y-axis and get a cylindrical shell.

$$V = 2\pi \int_0^2 x e^{x^2} dx = \pi \int_0^4 e^u du = \pi e^u \Big|_0^4$$

$\boxed{\begin{array}{l} u = x^2 \\ du = 2x\,dx \end{array}}$

$$= \pi(e^4 - 1)$$

(D)