Good afternoon:
we will randomize then do this warm up together. write it down

Find volume of solid formed by revolving $y = x^2 + 6x + 9$ and $y = \sqrt{x+3}$ about x=-1

Reminders
tutoring tmrw 4-5p
assessment Weds

f(x) = $x^2 + 6x + 9$ about x=-1

g(x) = $\sqrt{x+3}$

f: $y = x^2 + 6x + 9$

$y = (x+3)^2$

parabola, left 3

$y = (x+3)^2$

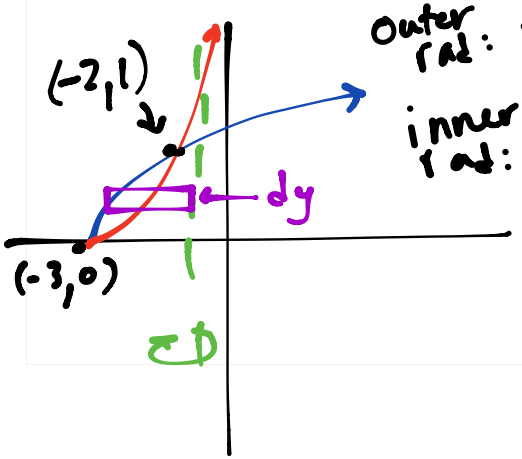
$\sqrt{y} - 3 = x$

$y = \sqrt{x+3}$

$y^2 - 3 = x$

$y = \sqrt{x+3}$

left 3



outer rad: $-1 - f(y) \Rightarrow -1 - (\sqrt{y} - 3)$

inner rad: $-1 - g(y) \Rightarrow -1 - (y^2 - 3)$

$$V = \pi \int_0^1 \left(-1 - (\sqrt{y} - 3)\right)^2 - \left(-1 - (y^2 - 3)\right)^2 dy$$

$$V = \pi \int_0^1 \left(-1 - \sqrt{y} + 3\right)^2 - \left(-1 - y^2 + 3\right)^2 dy$$

$$V = \pi \int_0^1 (2 - \sqrt{y})^2 - (2 - y^2)^2 dy$$

HW

2010ab4

(c) Solving $y = 2\sqrt{x}$ for x yields $x = \frac{y^2}{4}$.

Each rectangular cross section has area $\left(3\frac{y^2}{4}\right)\left(\frac{y^2}{4}\right) = \frac{3}{16}y^4$.

Volume $= \int_0^6 \frac{3}{16}y^4\,dy$

(d)

$$\pi\int_0^6 \left(10^2 - \left(10 - \frac{y^2}{4}\right)^2\right)dy$$

2010ab1b

(c) $\int_0^2 (6 - 4\ln(3-x))^2\,dx = 26.266$ or 26.267

2003ab1

(c) Length $= \sqrt{x} - e^{-3x}$

Height $= 5\left(\sqrt{x} - e^{-3x}\right)$

1.554

Volume $= \int_T^1 5\left(\sqrt{x} - e^{-3x}\right)^2\,dx = 1.554$

2005ab1b

(c) Volume $= \int_0^S \frac{\pi}{2}\left(\frac{f(x)-g(x)}{2}\right)^2 dx$

$= \int_0^S \frac{\pi}{2}\left(\frac{1+\sin(2x)-e^{x/2}}{2}\right)^2 dx$

$= 0.077$ or 0.078 0.077

(d)

$$\pi\int_1^{1.764} \left(\left(5 - \frac{1}{2}\arcsin(x-1)\right)^2 - (5 - 2\ln x)^2\right)dx$$

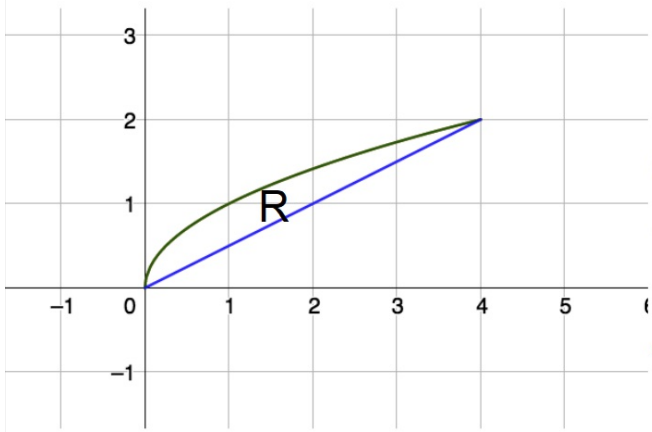
= 8.99870060173

8.999

Self-Assess
How do you feel about

- disc method volume (only 1 function, or region adjacent to axis)
- disc method dy
- washer method, x-axis
- washer method, other horizontal axis
- washer method, y-axis; other vertical axis
- volume by cross section: square, rectangle, semicircle, triangle

$y = \sqrt{x}$ $y = \frac{1}{2}x$



Set up integral(s) to find volume if:

a.) R is revolved around x-axis

b.) R is revolved around y-axis

c.) R is revolved around y=2

d.) R is revolved around x=-1

e.) R is base, cross sections semicircles

f.) R is base, cross sections rectangles, 3:1 height:base

g.) R is base, cross sections equilateral triangles

See next page for solutions

a) $\pi\int_0^4 (\sqrt{x})^2 - (\frac{1}{2}x)^2\,dx \Rightarrow \pi\int_0^4 x - \frac{1}{4}x^2\,dx$

b) $x = y^2 \qquad 2y = x$

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

c) $\pi\int_0^4 (2 - \frac{1}{2}x)^2 - (2 - \sqrt{x})^2\,dx$

d) $\pi\int_0^2 (2y - -1)^2 - (y^2 - -1)^2\,dy$

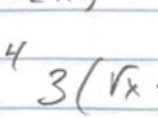
$$= \pi\int_0^2 (2y+1)^2 - (y^2+1)^2\,dy$$

e) $A = \frac{1}{2}\pi R^2 = \frac{1}{2}\pi\left(\frac{\sqrt{x} - \frac{1}{2}x}{2}\right)^2 \rightarrow \int_0^4 \left(\frac{1}{2}\cdot\pi\cdot\frac{1}{4}(\sqrt{x} - \frac{1}{2}x)^2\right)dx$

$$\frac{\pi}{8}\int_0^4 (\sqrt{x} - \frac{1}{2}x)^2\,dx$$

f) $A = 3(\sqrt{x} - \frac{1}{2}x)^2$

$V = \int_0^4 3(\sqrt{x} - \frac{1}{2}x)^2\,dx$

g) 

$A = \frac{1}{2}\cdot\frac{\sqrt{3}}{2}(\sqrt{x} - \frac{1}{2}x)^2$

$A = \frac{\sqrt{3}}{4}(\sqrt{x} - \frac{1}{2}x)^2$

$V = \int_0^4 \frac{\sqrt{3}}{4}(\sqrt{x} - \frac{1}{2}x)^2\,dx$

Two things to do

Need work on volume?

- Practice assessment on volume, assess is Weds.

Feel okay about volume?

- 1998 AP Mult Choice section: due after spring break