Let f and g be the functions given by $f(x) = 1 + \sin(2x)$ and $g(x) = e^{x/2}$. Let R be the shaded region in the first quadrant enclosed by the graphs of f and g as shown in the figure above.

(a) Find the area of R.

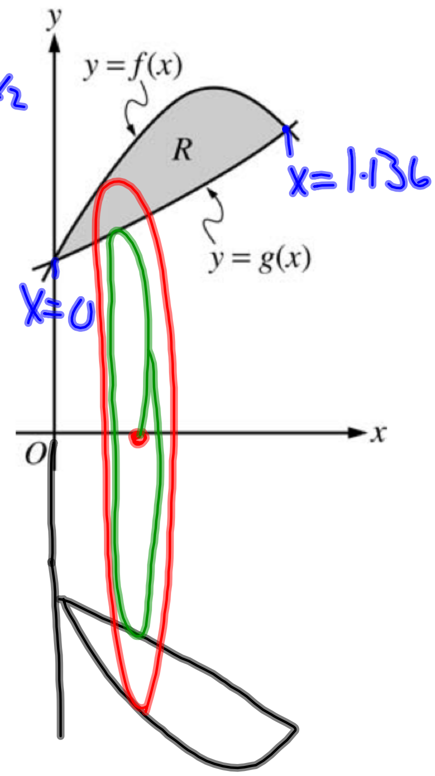
(b) Find the volume of the solid generated when R is revolved about the x-axis.

(c) The region R is the base of a solid. For this solid, the cross sections perpendicular to the x-axis are semicircles with diameters extending from $y = f(x)$ to $y = g(x)$. Find the volume of this solid.

A) $A = \int_0^{1.136} \left(1+\sin(2x) - e^{x/2}\right)dx$

$= \boxed{.429u^2}$

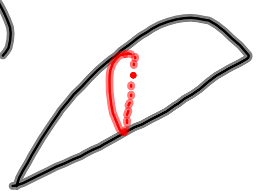
$1+\sin(2x) = e^{x/2}$



B) $V = \pi \int_0^{1.136} (1+\sin(2x))^2 - (e^{x/2})^2 \, dx$

$= \boxed{4.267u^3}$

c)



$A = \frac{1}{2}\pi r^2$

$A = \frac{1}{2}\pi(\quad)^2$

$r = \frac{1+\sin(2x) - e^{x/2}}{2}$

$V = \frac{1}{2}\pi \int_0^{1.136} \left(\frac{1+\sin(2x) - e^{x/2}}{2}\right)^2$

$= \boxed{.0777u^3}$

Let R be the shaded region bounded by the graph of $y = \ln x$ and the line $y = x - 2$, as shown above.

(a) Find the area of R.

(b) Find the volume of the solid generated when R is rotated about the horizontal line $y = -3$.

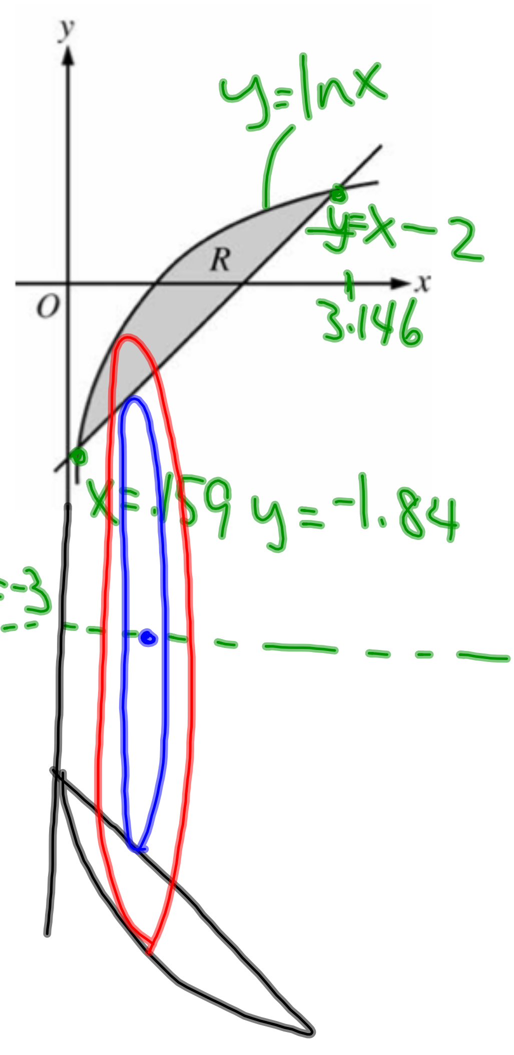
(c) Write, but do not evaluate, an integral expression that can be used to find the volume of the solid generated when R is rotated about the y-axis.

a) $A = \int_{.159}^{3.146} (\ln x - (x-2))\,dx$

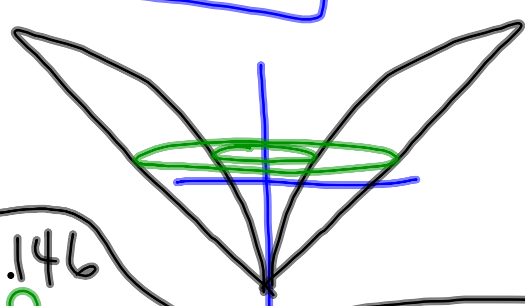
$= \boxed{1.949 u^2}$

b) $V = \pi \int_{.159}^{3.146} (\ln x + 3)^2 - (x - 2 + 3)^2 \, dx$

$= \boxed{34.2 u^3}$



c)

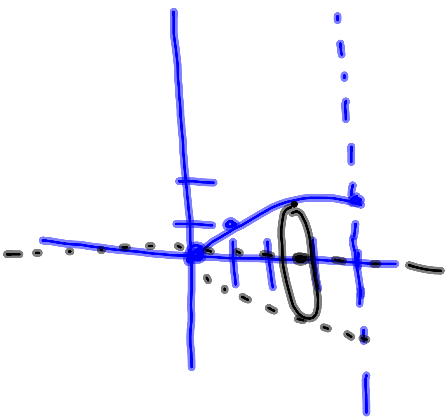


$V = \pi \int_{-1.84}^{1.146} (y+2)^2 - (e^y)^2 \, dy$

The region bounded by the curve $\boxed{y = \sqrt{x}}$ the $\boxed{\text{x-axis}}$ and the line $\boxed{x = 4}$ is revolved about the x-axis. Find the volume of the solid.

$A = \pi r^2$

Use discs



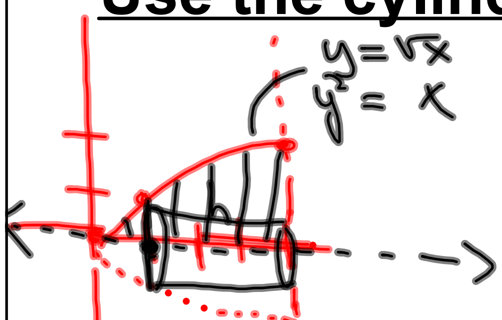
$$V = \pi \int_0^4 \overbrace{(\sqrt{x})^2}^{x} \, dx$$

$$= \pi \cdot \frac{x^2}{2} \Big|_0^4 = \frac{\pi \cdot 16}{2} - 0 = 8\pi$$

The region bounded by the curve $\boxed{y = \sqrt{x}}$ the $\boxed{\text{x-axis}}$ and the line $\boxed{x = 4}$ is revolved about the $\boxed{\text{x-axis}}$. Find the volume of the solid.

$\boxed{2\pi r h}$

Use the cylindrical shell method



Shell = parallel to the revolving axis

$2\pi r \cdot h$

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

$$= \boxed{8\pi}$$

The region bounded by the curve $y = 4 - x^2$, $y = x$, and $x = 0$ is revolved around the y-axis to form a solid. Find the volume of the solid.

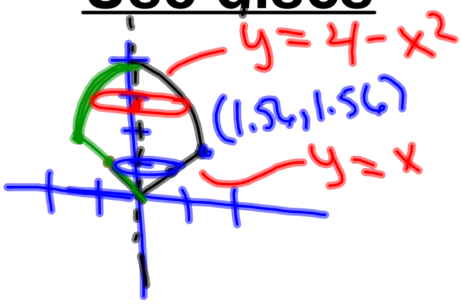
$x^2 = 4 - y$

$x = \sqrt{4-y}$

$4 - x^2 = x$

$x = 1.56$

Use discs



$$V = \pi \int_{1.56}^{4} \left(\sqrt{4-y}\right)^2 \, dy = 9.35$$

$$+ \quad \pi \int_{0}^{1.56} (y)^2 \, dy \qquad + 3.97$$

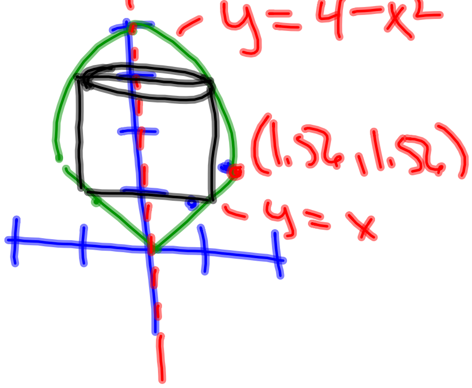
$$\boxed{13.33}$$

The region bounded by the curve $\boxed{y = 4 - x^2}$, $\boxed{y = x}$, and $\boxed{x = 0}$ is revolved around the $\boxed{\text{y-axis}}$ to form a solid. Find the volume of the solid.

$2\pi r h$

Use the cylindrical shell method

parallel w/ revolving Axis



$$V = \int_0^{1.56} 2\pi x(4 - x^2 - x)\,dx$$

$$= 13.3$$

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revolving around y

$$S = \int_a^b 2\pi\,(g(y))\sqrt{1 + (g'(y))^2}\,dy$$

revolving around x

$$S = \int_a^b 2\pi\,g(x)\sqrt{1 + (g'(x))^2}\,dx$$