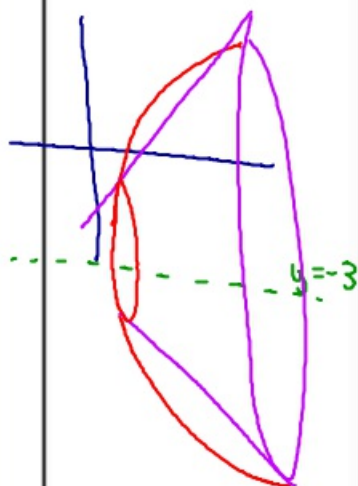


d) Volume using sq. cross section whose base runs from  $y = \ln x$  to  $y = x - 2$  perpendicular to  $x$ -axis.

$$V = \int (\text{area})$$

$$V = \int_a^b (\ln x - (x-2))^2 dx$$

$$\text{base} = \ln x - (x-2)$$



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Question 1

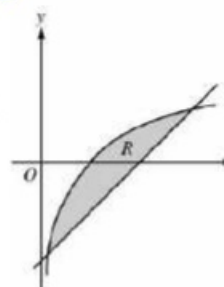
Let  $R$  be the shaded region bounded by the graph of  $y = \ln x$  and the line  $y = x - 2$ , as shown above.

(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.

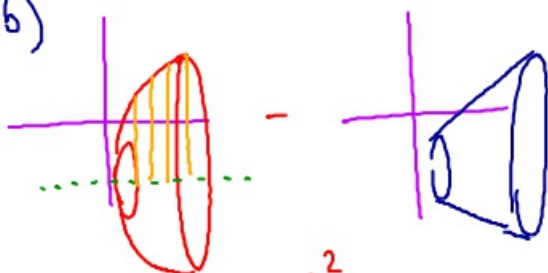
$$y = \ln x$$



$$\text{a) Area} = \int_a^b [\ln x - (x-2)] dx = 1.949$$

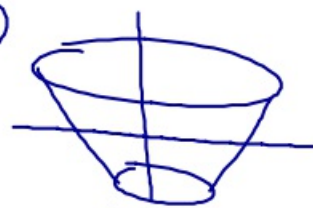
$$\text{Area} = \int_c^d (y+2) - e^y dy =$$

b)



$$V = \pi \int_a^b (\ln x - (-3))^2 dx \quad - \quad V = \pi \int_c^d (x-2 - (-3))^2$$

c)



$$\pi \int_c^d (y+2 - 0)^2 dy \quad - \quad \pi \int_c^d (e^y - 0)^2 dy$$

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e) Perimeter

$$L = \int \sqrt{1 + \left(\frac{dy}{dx}\right)^2}$$

$$y = \ln x$$

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

$$y = x - 2$$

$$\frac{dy}{dx} = 1$$

$$\text{Perimeter} = \int_a^b \sqrt{1 + \left(\frac{1}{x}\right)^2} + \sqrt{1 + (1)^2}$$