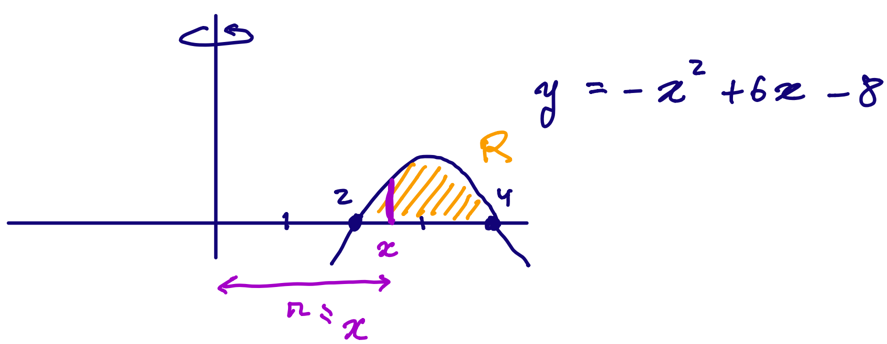
R region bounded by: $\begin{cases} y = -x^2+6x-8 \\ y = 0 \end{cases}$

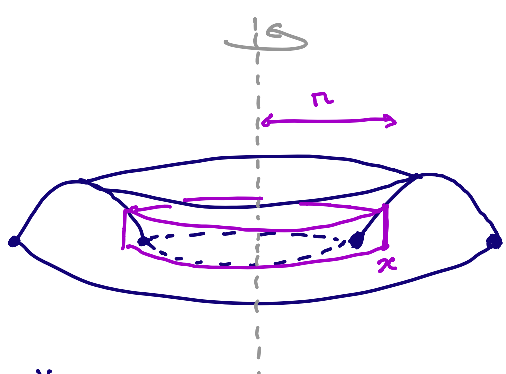
S obtained from R by rotating $\boxed{y\text{-axis}}$.

Volume $(S) = ?$

$$y = -x^2+6x-8 = -(x^2-6x+8)$$

$$= -(x-4)(x-2)$$



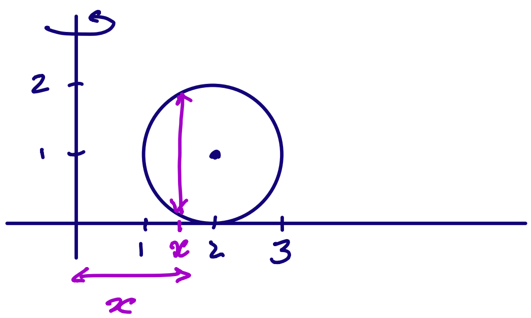


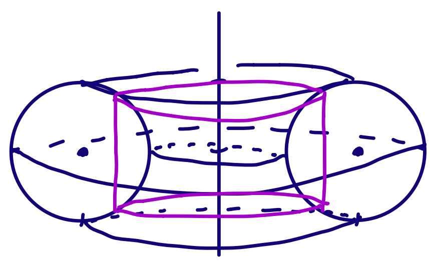
$$V = \int_2^4 \underbrace{2\pi x}_{\text{CIRC}} \underbrace{(-x^2+6x-8)}_{\text{HEIGHT}} \underbrace{dx}_{\text{THICK}}$$

$R: (x-2)^2 + (y-1)^2 = 1$

Ⓐ rotate

y-axis





height = ?

$$(y-1)^2 = 1 - (x-2)^2$$

$$y - 1 = \pm\sqrt{1-(x-2)^2}$$

$$y = 1 \pm \sqrt{1-(x-2)^2}$$

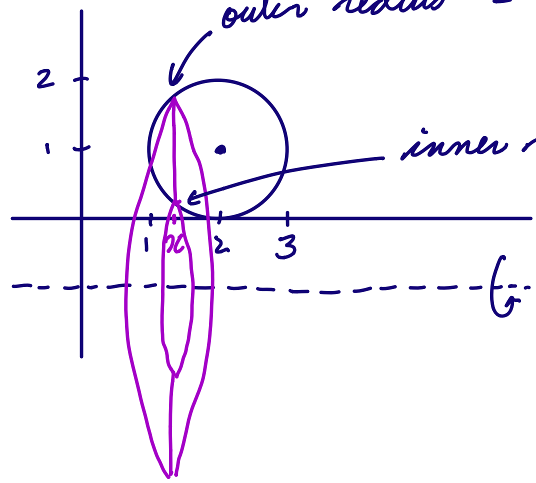
heigh = top - bot.

$$= \left(1 + \sqrt{1-(x-2)^2}\right) - \left(1 - \sqrt{1-(x-2)^2}\right)$$

$$= 2\sqrt{1-(x-2)^2}$$

$$V = \int_1^3 2\pi x \; 2\sqrt{1-(x-2)^2}\, dx$$

outer radius $= 1 + \sqrt{1-(x-2)^2} + 1$



inner radius $= 1 - \sqrt{1-(x-2)^2} + 1$

$y = -1$

$$V = \int_1^3 \pi \left[\left(2 + \sqrt{1-(x-2)^2}\right)^2 - \left(2 + \sqrt{1-(x-2)^2}\right)^2 dx \right.$$

SECTION 5.4 prob: 37 – 43

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* Riemann sums.
* Inverses ($(f^{-1})'(1) = ?$)
* Fundamental thm : $\dfrac{d}{dx} \displaystyle\int_0^{x^2} \sin(2t)\,dt$
* volumes / areas

$$\int e^{\sqrt{x}}\,dx \qquad y = \sqrt{x}$$

$$y^2 = x$$

$$2y\,dy = dx$$

$$\| $$

$$\int \underbrace{e^y}_{dv}\;\underbrace{2y}_{u}\;\underbrace{dy}\qquad u = 2y \qquad dv = e^y\,dy$$

$$du = 2\,dy \qquad v = e^y$$

$$= 2ye^y - \int 2e^y\,dy = 2ye^y - 2e^y + C$$

$$= 2\sqrt{x}\,e^{\sqrt{x}} - 2e^{\sqrt{x}} + C$$