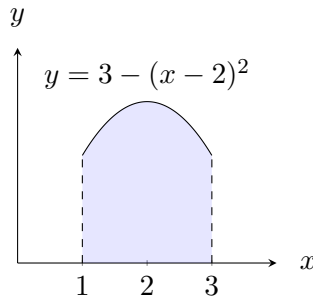


3. [15 points] Flora and Nile are collecting fruits in the forest and they have brought several containers of different shapes. **Write an integral** that computes the volume of each of the following containers. **Do not evaluate your integrals.**

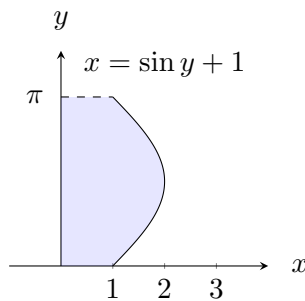
- a. [5 points] The first container is in the shape formed by revolving the following region about the y -axis.



Solution:

$$\int_1^3 2\pi x(3 - (x - 2)^2) dx \text{ or } \pi(3^2 - 1^2) \cdot 2 + \int_2^3 \pi((2 + \sqrt{3 - y})^2 - (2 - \sqrt{3 - y})^2) dy$$

- b. [5 points] The second container is in the shape formed by revolving the following region about the line $x = 3$.



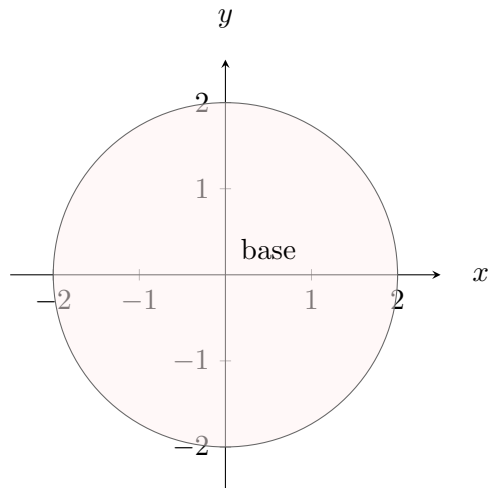
Solution:

$$\int_0^\pi \pi(3^2 - (3 - (\sin y + 1))^2) dy$$

or

$$\pi(3^2 - 2^2) \cdot \pi + \int_1^2 2\pi(3 - x)((\pi - \sin^{-1}(x - 1)) - \sin^{-1}(x - 1)) dx$$

- c. [5 points] The third container has a circular base with equation $x^2 + y^2 = 4$ (of radius 2 centered at the origin), with **square** cross-sections perpendicular to the x -axis.



Solution:

$$\int_{-2}^2 (2\sqrt{4-x^2})^2 dx$$