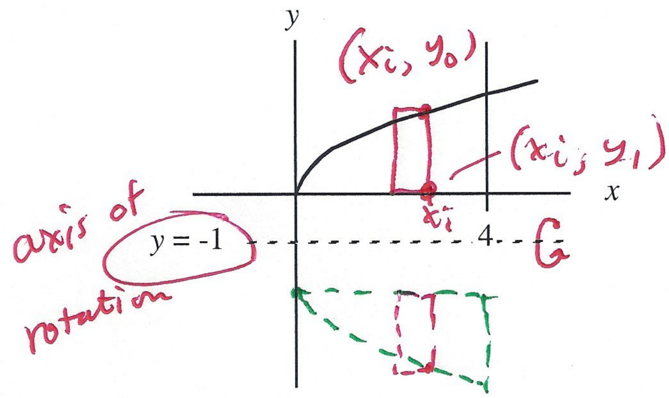
9. $y = \sqrt{x}$, $y = 0$, and $x = 4$, rotated about the line $y = -1$.



$y_o = \sqrt{x}$ $\quad y_1 = 0$

$$V_i = \pi\left[r_o^2 - r_1^2\right]\Delta x$$

$$= \pi\left[(y_o+1)^2 - (1)^2\right]\Delta x$$

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

$$= \pi\left[x + 2\sqrt{x} + 1 - 1\right]\Delta x$$

$$= \pi\left[x + 2\sqrt{x}\right]dx$$

Washer

$r_o = y_o - (-1)$

$r_1 = y_1 - (-1)$

$r_o = y_o + 1$

$r_1 = 0 + 1 = 1$

$$V = \pi\int_0^4 (x + 2x^{1/2})\,dx$$

$$= \pi\left[\frac{x^2}{2} + 2\cdot x^{3/2}\cdot\frac{2}{3}\right]\Big|_0^4$$

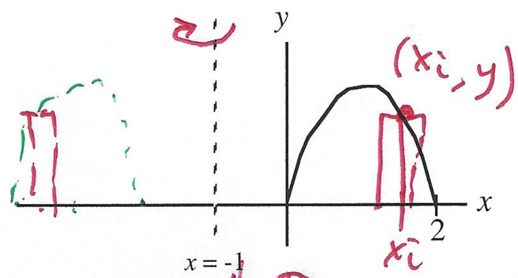
$$= \pi\left[\frac{x^2}{2} + \frac{4}{3}x^{3/2}\right]\Big|_0^4$$

$$= \pi\left[\left(\frac{16}{2} + \frac{4}{3}\cdot 4^{3/2}\right) - (0+0)\right]$$

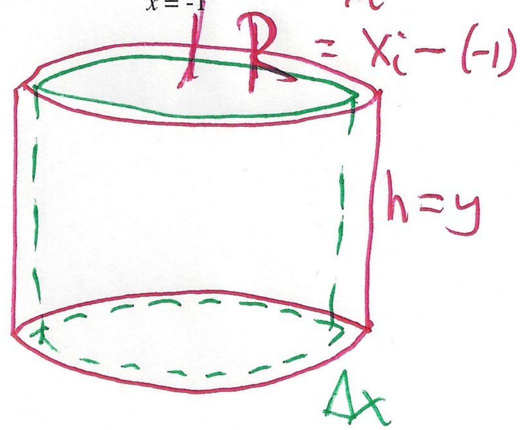
$$= \pi\left[8 + \frac{4}{3}\cdot\sqrt{4}^3\right]$$

$$= \pi\left[8 + \frac{4}{3}\cdot 8\right] = \pi\left[\frac{24}{3} + \frac{32}{3}\right] = \boxed{\frac{56}{3}\pi \text{ units}^3}$$

10. $y = 2x - x^2$ and $y = 0$, rotated about the line $x = -1$.



$$V_i = 2\pi R h \,\Delta x$$
$$= 2\pi (x+1)\cdot y \,\Delta x$$
$$= 2\pi \underbrace{(x+1)(2x-x^2)}_{\text{distribute}} \Delta x$$
$$= 2\pi\left[2x^2 - x^3 + 2x - x^2\right]\Delta x$$
$$= 2\pi\left[-x^3 + x^2 + 2x\right]\Delta x$$



$R = x + 1$

$$V = 2\pi\int_0^2 (-x^3 + x^2 + 2x)\,dx$$
$$= 2\pi\left(-\frac{x^4}{4} + \frac{x^3}{3} + x^2\right)\Big|_0^2$$

An option is to factor out x^2 before putting in the limits. (not required)

$$= 2\pi\left[x^2\left(-\frac{\cancel{x}^2}{4} + \frac{x}{3} + 1\right)\right]\Big|_0^2$$

$$= 2\pi\left[2^2\left(-\frac{4}{4} + \frac{2}{3} + 1\right) - 0^2(0 + 0 + 1)\right]$$
$$= 2\pi\left[4\left(-1 + \frac{2}{3} + 1\right)\right]$$
$$= 2\pi \cdot 4 \cdot \frac{2}{3}$$
$$= \boxed{\frac{16\pi}{3}\text{ units}^3}$$