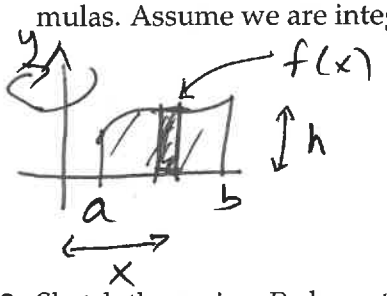
SECTION 2.3: VOLUMES OF REVOLUTION USING CYLINDRICAL SHELLS
DAY 2

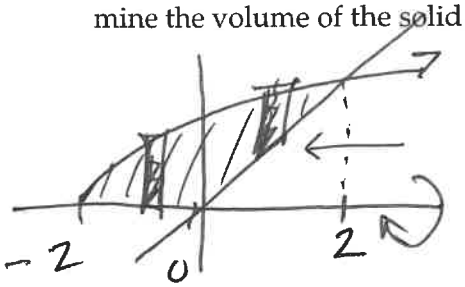
1. In the space below, write the formula for the Cylindrical Shells Method with accompanying formulas. Assume we are integrating with respect to x.



$$V = \int_a^b 2\pi x f(x)\,dx$$

2π (r)(h) (thickness)

2. Sketch the region R above the x-axis that is bounded by $y = \sqrt{x+2}$ and $y = x$. We want to determine the volume of the solid obtained by rotating R about the x-axis.



$y = \sqrt{x+2}$ or $x = y^2 - 2$

$y = x$ or $x = y$ ☺

$\sqrt{x+2} = x$ or $x+2 = x^2$ or $x^2 - x - 2 = 0$

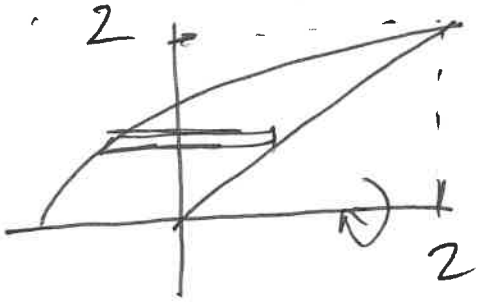
so $(x-2)(x+1) = 0$ $x = 2$

(a) Set up the integral(s) for the volume assuming you are using the Disk/Washer Method.

$$V = \underbrace{\int_{-2}^{0} \pi \left(\sqrt{x+2}\right)^2 dx}_{\text{disk}} + \underbrace{\int_{0}^{2} \pi \left(\left(\sqrt{x+2}\right)^2 - (x)^2\right) dx}_{\text{washer}}$$

$y - y^2 + 2$

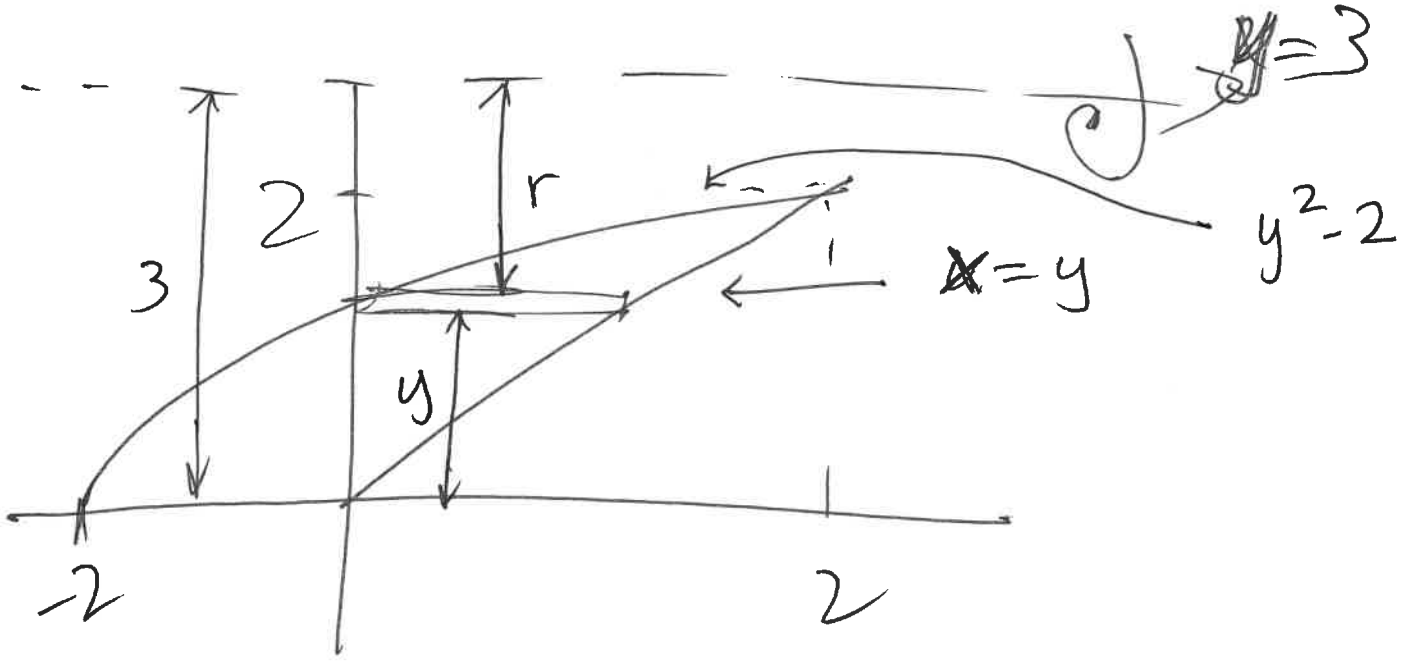
(b) Set up the integral(s) for the volume assuming you are using the Shell Method.



$$\int_0^2 \pi \left(y - (y^2 - 2)\right) dy$$

$$= \pi \int_0^2 \left(y^2 - y^3 + 2y\right) dy$$

$y = 3$



$$h = y - (y^2 - 2) = 2 + y - y^2$$

$$r = 3 - y$$

$$V = 2\pi \int_{-2}^{2} (3-y)(2+y-y^2)\, dy$$