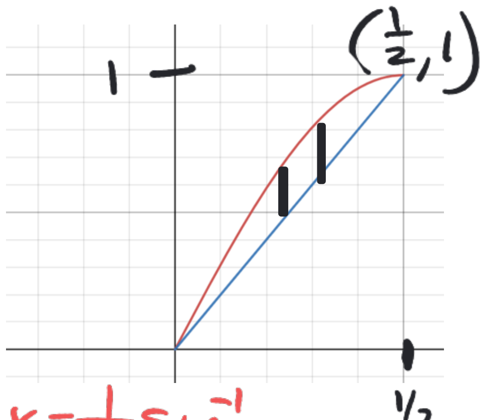
To find the intersection you would need to look at the graph & work backwards

Consider the region bound by $y = \sin(\pi x)$ and $y = 2x$ as shown. Set up (do not evaluate) integrals for each of the following situations.

a) The area of the shaded region with respect to x

$$\int_0^{1/2} (2x - \sin \pi x)\,dx$$

Top − bottom

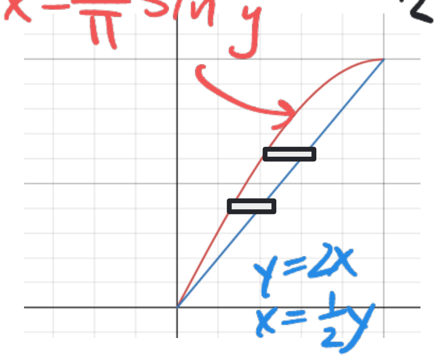



b) The area of the shaded region with respect to y

$y = \sin(\pi x) \Rightarrow \pi x = \sin^{-1} y \Rightarrow x = \frac{1}{\pi}\sin^{-1} y$

$$\int_0^1 \left(\frac{1}{2}y - \frac{1}{\pi}\sin^{-1} y\right) dy$$

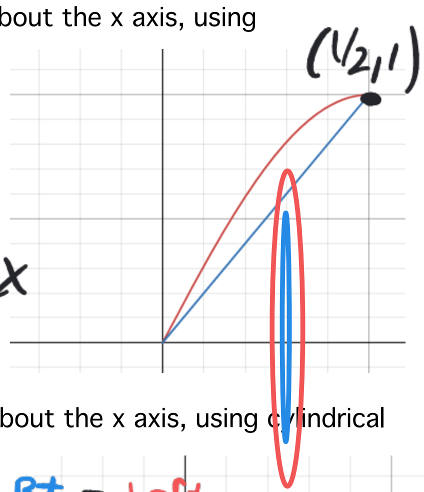
right − left




c) The volume of the solid generated when the region is revolved about the x axis, using disks/washers.

$$\pi \int_0^{1/2} \left( (\sin(\pi x))^2 - (2x)^2 \right) dx$$

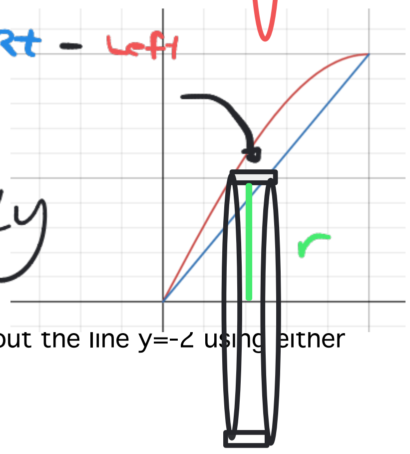
$(R_o^2 - R_i^2)$




d) The volume of the solid generated when the region is revolved about the x axis, using cylindrical shells.

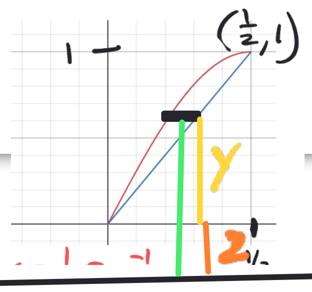
"$2\pi r h$"  h = Rt − Left

$$\int_0^1 2\pi y \left(\frac{1}{2}y - \frac{1}{\pi}\sin^{-1} y\right) dy$$




e) The volume of the solid generated when the region is revolved about the line y=-2 using either method.

$$\int_0^1 2\pi (y+2)\left(\frac{1}{2}y - \frac{1}{\pi}\sin^{-1} y\right) dy$$




y = −2

$r = y + 2$