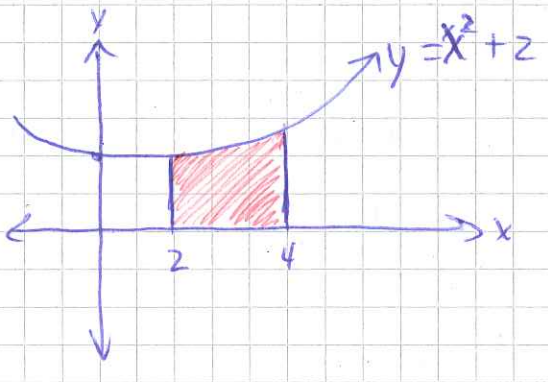
Areas under neath curves

$\int$um up all the little rectangles.

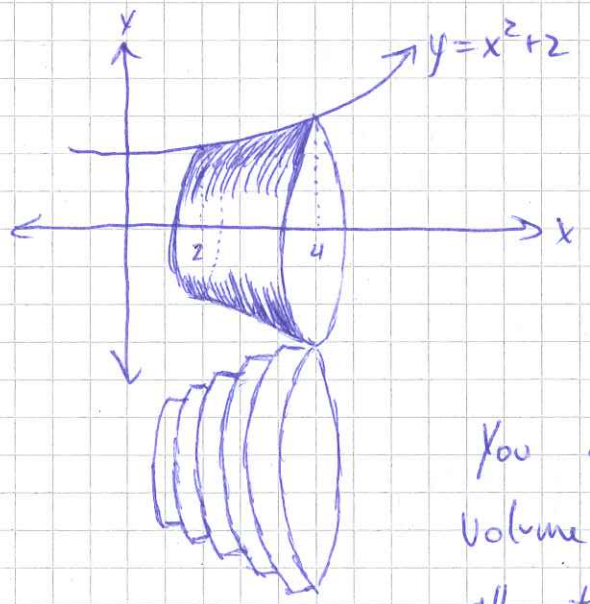
$\therefore$ for $y = x^2 + 2$ from 2 to 4.



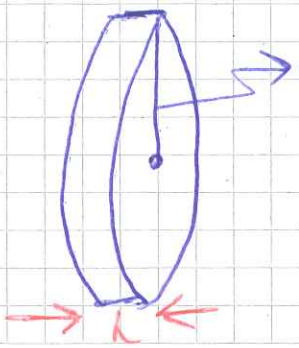
$$A = \int_2^4 (x^2+2)\,dx$$

Volumes of revolution

Imagine we rotate this shape 360° about $y=0$ (x-axis)



You could aproximate the volume if you $\int$ummed up all the little disks.



radius $= y = x^2 + 2$

h = width $= dx$

The volume of a cylinder is

$$A = \pi r^2 \cdot h$$

So we have

$$A = \pi (y)^2 \cdot dx$$

$$= \pi (x^2+2)^2 dx$$

But this is the volume for just 1 disk. To find the TOTAL volume from 2 to 4,

$$A_T = \int_2^4 \pi (x^2+2)^2 \cdot dx$$

To solve: M1 → GDC

M2 → simplify <u>first</u>

$$= \int_2^4 \pi (x^2+2)(x^2+2)\, dx$$

$$= \int_2^4 \pi (x^4+4x^2+4)\, dx$$

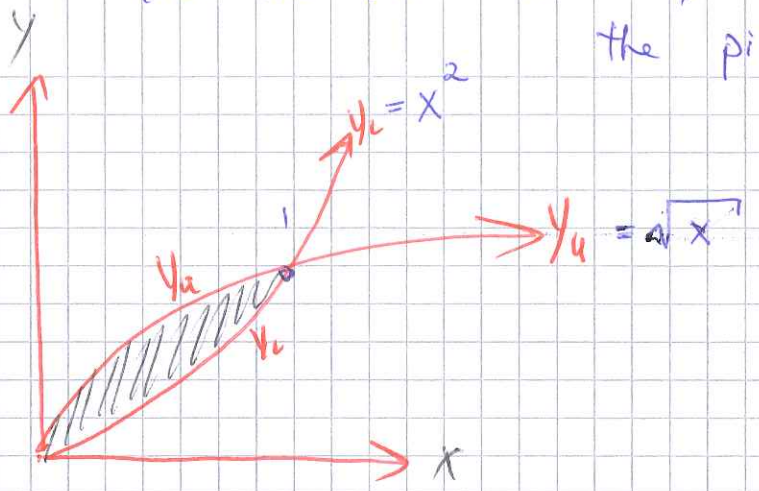
$$= \pi \left[\frac{1}{5}x^5 + \frac{4}{3}x^3 + 4x \right]_2^4$$

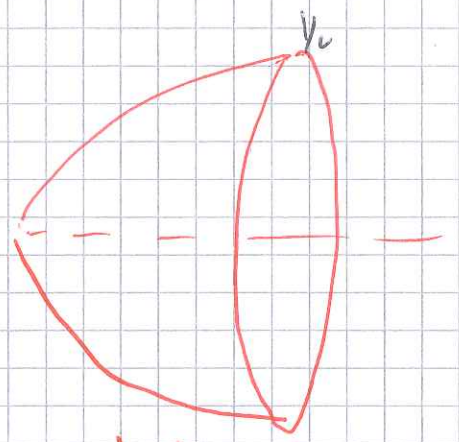
$$= \pi \left[\left(\frac{1}{5}(4)^5 + \frac{4}{3}(4)^3 + 4(4) \right) - \left(\frac{1}{5}(2)^5 + \frac{4}{3}(2)^3 + 4(2) \right) \right]$$

$$\cong \pi \left[281.0\overline{6} \right]$$

$$\cong 882.99 \text{ units}^3$$

For the volume bound by two curves, build up the pieces individually.





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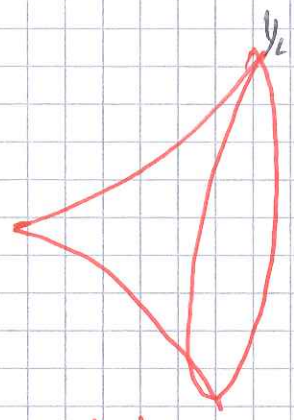
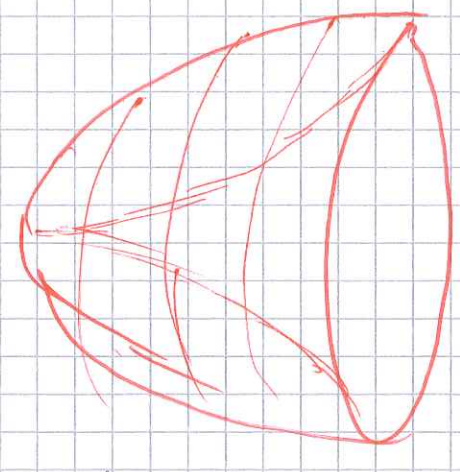


$V_1 \quad - \quad V_2$

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



$= V_{Final}$