P1

$f(x) = x^3 - 3x^2 - 3x$

$g(x) = x$

$\Rightarrow$ buscamos $f(x) \perp g(x)$

$x^3 - 3x^2 - 3x = 0 \Rightarrow$

$x = 0$

$x^3 - 3x^2 - 3x = x$

$\Rightarrow \quad x^3 - 3x^2 - 4x = 0$

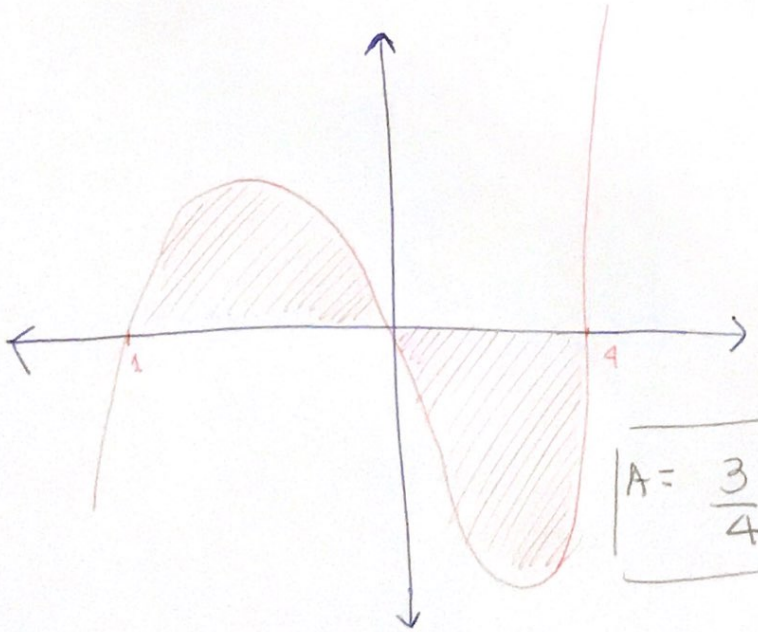
$\Rightarrow$ buscamos los ceros

$\Rightarrow \quad x^3 - 3x^2 - 4x = 0$

$\Rightarrow \quad x(x^2 - 3x - 4) = 0$

$\Rightarrow \quad x(x-4)(x+1) = 0$

$\Rightarrow \quad x_1 = 4 \; , \; x_2 = -1, \; x_3 = 0$

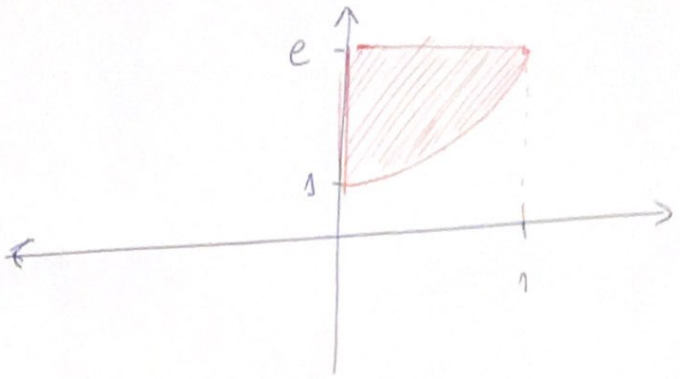


$$A = \int_{-1}^{4} |f(x) - g(x)| \, dx$$

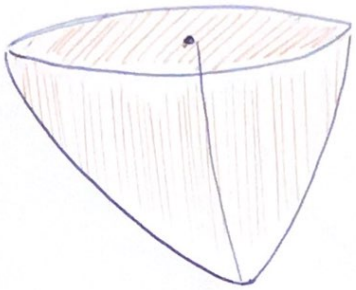
$$A = \int_{-1}^{0} (x^3 - 3x^2 - 4x) \, dx + \int_{0}^{4} (-x^3 + 3x^2 + 4x) \, dx$$

$$A = \frac{3}{4} + 32$$

P2

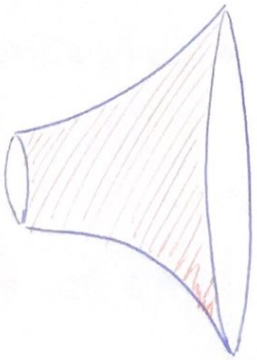


⇒ en rotación con respecto al eje OY



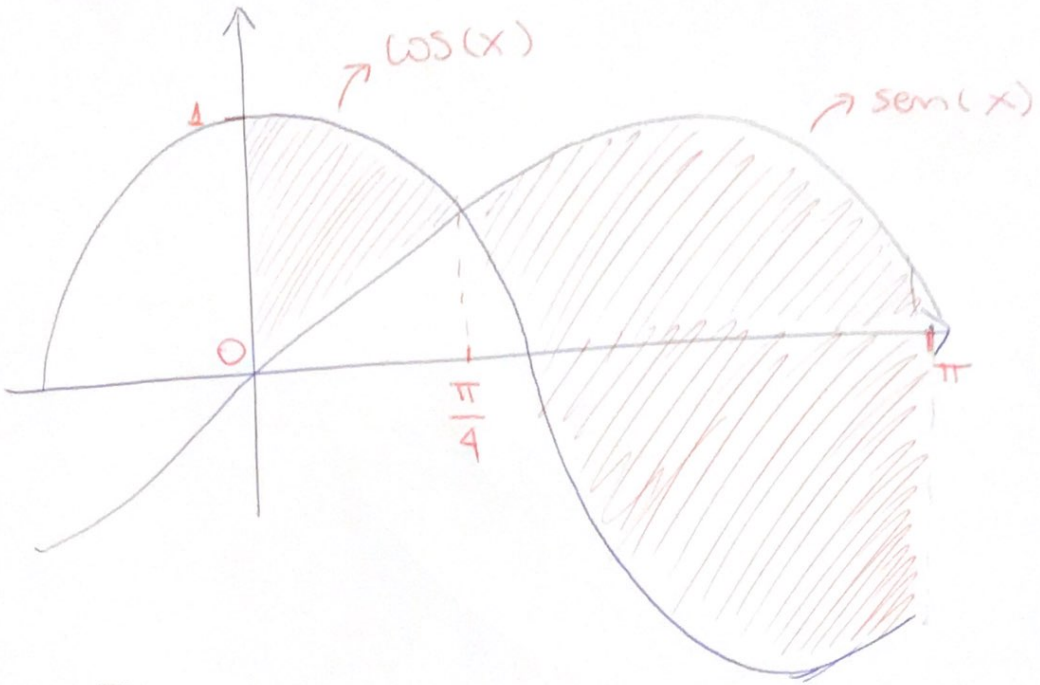
$$\int_0^1 2e^x \pi x \, dx = \boxed{2\pi} \quad //$$

⇒ en rotación con respecto al eje OX



$$\int_1^e e^{2x} \pi \, dx = \frac{1}{2}(e^{2} - e^{0})\pi$$

P3



$$A = \int_0^{\pi/4} |\operatorname{sen}(x) - \cos(x)|\,dx + \int_{\pi/4}^{\pi} (\operatorname{sen}(x) - \cos(x))\,dx$$

$$= \int_0^{\pi/4} (\cos(x) - \operatorname{sen}(x))\,dx + \int_{\pi/4}^{\pi} (\operatorname{sen}(x) - \cos(x))\,dx$$

$$= \operatorname{sen}(x)\Big|_0^{\pi/4} + \cos(x)\Big|_0^{\pi/4} - \cos(x)\Big|_{\frac{\pi}{4}}^{\pi} - \operatorname{sen}(x)\Big|_{\frac{\pi}{4}}^{\pi}$$

$$= \frac{\sqrt{2}}{2} + \frac{\sqrt{2}}{2} - 1 + 1 + \frac{\sqrt{2}}{2} + \frac{\sqrt{2}}{2} = \boxed{2\sqrt{2}}$$