# Parcial 1 A.M II

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## Ejercicio 1

a) $f(x) = (x^2-1)^2$ $\qquad g(x) = 1 - x^2$

$f(0) = (0^2-1)^2 \qquad f(1) = (1^2-1)^2$

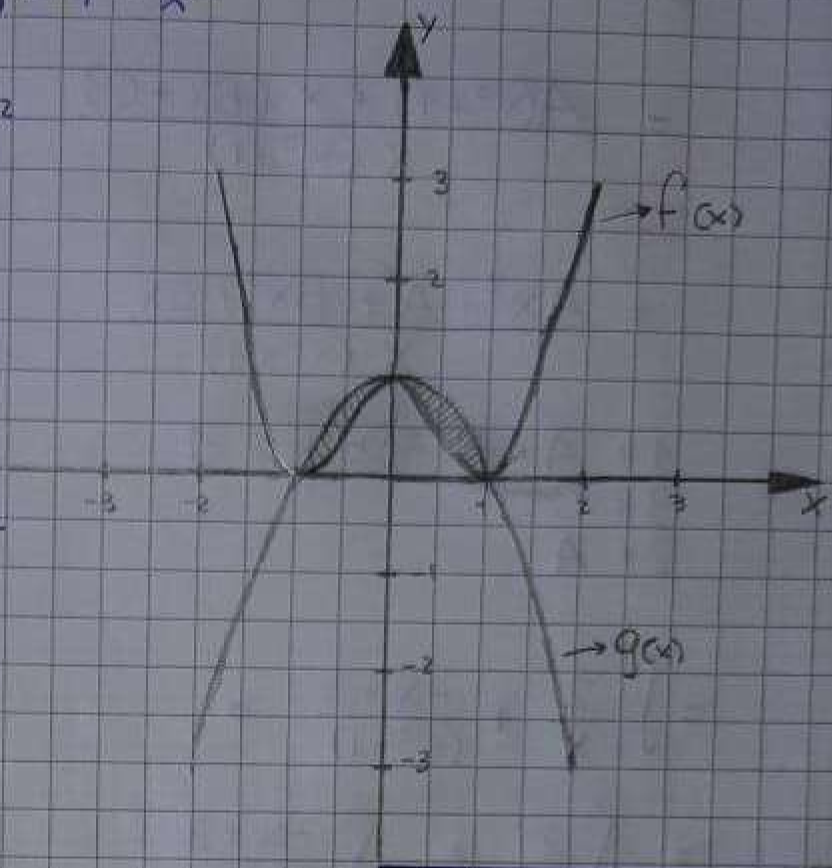
$f(0) = 1 \qquad f(1) = 0$

$g(0) = 1 - 0^2 \qquad g(1) = 1-1^2$

$g(0) = 1 \qquad g(1) = 0$

$f(-1) = ((-1)^2-1)^2 \qquad g(-1) = 1-(-1)^2$

$f(-1) = 0 \qquad g(-1) = 0$




$A = \int_{-1}^{1} g(x) - \int_{-1}^{1} f(x)$

$= \int_{-1}^{1} (1-x^2)\,dx - \int_{-1}^{1} (x^2-1)^2\,dx$

$= \left[ x - \frac{x^3}{3} \Big|_{-1}^{1} \right] - \left[ \frac{x^5}{5} - \frac{2x^3}{3} + x \Big|_{-1}^{1} \right]$

$\int (x^2-1)^2\,dx \quad u = x$

$= \int x^4 - 2x^2 + 1$

$= \frac{x^5}{5} - \frac{2x^3}{3} + x$

$= \left[ \left[1 - \frac{1}{3}\right] - \left[-1 - \left(\frac{-1}{3}\right)\right] \right] - \left[ \left[\frac{3}{15} - \frac{10}{15} + 1\right] - \left[\frac{-3}{15} + \frac{10}{15} - 1\right] \right]$

$= \left[\frac{2}{3} + \frac{2}{3}\right] - \left[\frac{8}{15} + \frac{8}{15}\right]$

$= \frac{4}{3} - \frac{16}{15}$

$\boxed{A = \frac{4}{15}}$

b) $\displaystyle\int \frac{2+3x+x^2}{x\cdot(x^2+1)}\,dx = \frac{A}{x} + \frac{Bx+C}{(x^2+1)}$

$$= \frac{A(x^2+1) + x\cdot(Bx+C)}{x\cdot(x^2+1)}$$

$$= \frac{Ax^2 + A + Bx^2 + Cx}{x\cdot(x^2+1)}$$

$1 = A + B \longrightarrow B = -1$
$3 = C$
$2 = A$

$$= \int \frac{2}{x} + \frac{-x+3}{(x^2+1)} =$$

$$= \int \frac{2}{x} + \int \frac{-x+3}{x^2+1}$$

$$= \left[2\int \frac{1}{x}\right] + \left[\frac{-1}{2}\int \frac{2x}{x^2+1} + 3\cdot\int \frac{1}{x^2+1}\right]$$ (Busco los $k_1$ y $k_2$)

$$= 2\ln|x| + \frac{-\ln|x^2+1|}{2} + 3\cdot\frac{1}{1}\,\mathrm{arctg}(x) + C$$

$$\boxed{= 2\ln|x| - \frac{\ln|x^2+1|}{2} + 3\,\mathrm{arctg}(x) + C}$$