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CORTO #9 Cálculo Integral (15 min)

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1. Resuelva la siguiente integral $\int \frac{x^2+2x-4}{x^3+4x}\,dx$

$$\int \frac{x^2+2x-4}{x(x^2+4)}\,dx = \underbrace{\int -\frac{1}{x}\,dx}_{①} + \underbrace{\int \frac{2x+2}{x^2+4}\,dx}_{②}$$

$$\frac{x^2+2x-4}{x(x^2+4)} = \frac{A}{x} + \frac{Bx+C}{x^2+4}$$

$$x^2+2x-4 = A(x^2+4) + (Bx+C)(x)$$

$$x^2+2x-4 = Ax^2+4A+Bx^2+Cx$$

$x=0$;

$$-4 = A(0)^2 + 4A + B(0)^2 + C(0)$$

$$-4 = 4A$$

$$4A = -4$$

$$A = -1$$

$$x^2+2x^1-4x^0 = x^2(-1) + 4(-1) + Bx^2 + Cx$$

$$x^2+2x^1-4x^0 = -x^2 - 4 + Cx + Bx^2$$

$$x^2+2x^1-4x^0 = -x^2 + Bx^2 + Cx - 4$$

$$1x^2+2x^1-4x^0 = (B-1)x^2 + Cx - 4 \quad ; \quad C=2$$

$$B-1=1$$

$$B=1+1$$

$$B=2$$

$A=-1$

$B=2$

$C=2$

① $-\int \frac{1}{x}\,dx = \boxed{-\ln|x|}$ (1)

② $\int \frac{2x}{x^2+4} + \frac{2}{x^2+4}\,dx$ (2.1) (2.2)

(2.1) $\int \frac{du}{u} = \ln|u| = \boxed{\ln|x^2+4|}$ (2.1)

$u = x^2+4$

$du = 2x\,dx$

(2.2) $2\int \frac{1}{x^2+4}\,dx$

usar fórmula de:

$\int \frac{1}{x^2+a}\,dx = \frac{1}{a}\arctan\left(\frac{x}{a}\right)$

$a = 4$

$2\left[\frac{1}{2}\arctan\left(\frac{x}{2}\right)\right] =$

$= \boxed{\arctan\left(\frac{x}{2}\right)}$ (2.2)

R// $-\ln|x| + \ln|x^2+4| + \arctan\left(\frac{x}{2}\right) + C$