# Parcial 1 A.M II

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## Ejercicio 2

a) $$\lim_{n\to\infty} n\cdot\arctan\left(\frac{1}{n}\right) = \lim_{n\to\infty} \frac{\arctan\left(\frac{1}{n}\right)}{\frac{1}{n}}$$

$$\overset{LH}{=} \lim_{n\to\infty} \frac{\frac{1}{1+\left(\frac{1}{n}\right)^2}\cdot\cancel{\left(\frac{-1}{n^2}\right)}}{\cancel{\left(\frac{-1}{n^2}\right)}}$$

$$= \lim_{n\to\infty} \frac{1}{1+\underbrace{\left(\frac{1}{n}\right)^2}_{\to 0}} = \boxed{1}$$

$$\lim_{n\to\infty} \sqrt{n^2+2n}-n = \lim_{n\to\infty} \left(n\cdot\sqrt{1+\frac{2}{n}}\right)-n$$

$$= \lim_{n\to\infty} n\cdot\left(\sqrt{1+\frac{2}{n}}-1\right)$$

$$= \lim_{n\to\infty} \frac{\sqrt{1+\frac{2}{n}}-1}{\frac{1}{n}}$$

$$\overset{LH}{=} \lim_{n\to\infty} \frac{\frac{1}{2\sqrt{1+\frac{2}{n}}}\cdot\frac{-2}{n^2}}{\frac{-1}{n^2}} = \lim_{n\to\infty} \frac{\frac{-2}{2n^2\sqrt{1+\frac{2}{n}}}}{\frac{-1}{n^2}}$$

$$= \lim_{n\to\infty} \frac{-2n^2}{-2n^2\cdot\sqrt{1+\frac{2}{n}}}$$

$$= \lim_{n\to\infty} \frac{1}{\sqrt{1+\underbrace{\frac{2}{n}}_{\to 0}}} = \boxed{1}$$

b) $\sum_{n=1}^{\infty} \frac{n^{1/3}}{n^3+3n}$ $\qquad \frac{\sqrt[3]{n}}{n^3+3n} \leqslant \frac{\sqrt[3]{n}}{n^3}$

$$\frac{\sqrt[3]{n}}{n^3} = \frac{(n)^{1/3}}{n^3} = (n)^{1/3} \cdot n^{-3} = n^{\frac{1}{3}-3} = n^{-\frac{6}{3}} = \frac{1}{n^{6/3}}$$

$\Rightarrow \sum_{n=1}^{\infty} \frac{1}{n^{6/3}}$ (Converge por serie de P donde $P=2$ por ende $2>1$, y $P>1$)

Por prueba de comparacion de $\underbrace{\frac{\sqrt[3]{n}}{n^3+3n}}_{a_n} \leqslant \underbrace{\frac{\sqrt[3]{n}}{n^3}}_{B_n}$

como $B_n$ converge y

es mas grande que $a_n$

Rta: La Serie converge