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1. $\sum_{n=1}^{\infty} \frac{3n+1}{n^2-4} \longrightarrow \frac{3n}{n^2} < \frac{3n+1}{n^2-4}$ UJI BANDING

$$\frac{3}{n} \le \frac{3n+1}{n^2-4}$$

$$\hookrightarrow \sum \frac{3}{n} = 3\boxed{\sum \frac{1}{n}} \rightarrow \text{harmonik}$$

$$= \text{divergen}$$

2. $\sum_{n=1}^{\infty}$ → uji Banding Limit

$a_n = \dfrac{n}{n^2+2n-3}$

$b_n = n^{p-q}$

$= n^{1-2}$

$= \dfrac{1}{n}$ (Deret harmonik)

(divergen)

$S = \lim_{n \to \infty} \dfrac{a_n}{b_n}$

$= \lim_{n \to \infty} \dfrac{n}{n^2+2n-3} \cdot \dfrac{n}{1}$

$= 1 \quad (0 < L < \infty)$

Dapat disimpulkan bahwa kedua persamaan bersama divergen

3. $\sum_{n=1}^{\infty} \dfrac{n!}{n^{100}}$

dengan uji hasil bagi

$a_n = \dfrac{n!}{n^{100}} \qquad a_{n+1} = \dfrac{(n+1)!}{(n+1)^{100}}$

$\rho = \lim_{n \to \infty} \dfrac{a_{n+1}}{a_n}$

$= \lim_{n \to \infty} \dfrac{(n+1)!}{(n+1)^{100}} \cdot \dfrac{n^{100}}{n!}$

$= \lim_{n \to \infty} (n+1) \cdot \dfrac{n^{100}}{(n+1)^{100}}$

$= \lim_{n \to \infty} (n+1) \cdot \left(\dfrac{n}{n+1}\right)^{100}$

$= \infty \cdot \lim_{n \to \infty} \left(\dfrac{n}{n+1}\right)^{100}$

$= \infty \cdot 1$

$= +\infty > 1$ ← $\rho > 1$ divergen

∴ menurut UHB

$\sum_{n=1}^{\infty} \dfrac{n!}{n^{100}}$ divergen

4. $\sum_{k=1}^{\infty} \frac{3^k+k}{k!} \to a_k = \frac{3^k+k}{k!}$

$\Rightarrow$ Uji Hasil Bagi

$\Rightarrow \lim_{k\to\infty} \frac{a_{k+1}}{a_k} = \rho$

$\Rightarrow \rho = \lim_{k\to\infty} \frac{3^{k+1}+k+1}{(k+1)!} \cdot \frac{k!}{3^k+k}$

$= \lim_{k\to\infty} \frac{3^{k+1}+k+1}{(k+1)(3^k+k)} = \lim_{k\to\infty} \frac{3}{k+1} - \frac{2}{3^k+k} + \frac{3}{(k+1)(3^k+k)}$

$= 0 \to$ konvergen

$\Rightarrow$ maka $\sum_{k=1}^{\infty} \frac{3^k+k}{k!}$ konvergen ke 0 menurut uji hasil bagi

5) $\sum_{n=1}^{\infty} \frac{3n+1}{n^2-4}$

uji banding limit

$a_n = \frac{3n+1}{n^2-4}$ $\qquad \lim_{n\to\infty} \frac{a_n}{b_n} = \lim_{n\to\infty} \frac{3n+1}{n^2-4} \cdot \frac{n}{3}$

$b_n = \frac{3n}{n^2} = \frac{3}{n}$ $\qquad = \lim_{n\to\infty} \frac{3n^2+n}{3n^2-12} = 1$

$\downarrow$

deret harmonik, divergen

(6) $\sum_{n=1}^{\infty} \left(\frac{n}{3n+2}\right)^n$

utk $n \geq 1$ maka $a_n = \left(\frac{n}{3n+2}\right)^n$ positif.

$\lim_{n\to\infty} (a_n)^{1/n} = \lim_{n\to\infty} \left(\left(\frac{n}{3n+2}\right)^n\right)^{\frac{1}{n}} = \lim_{n\to\infty} \frac{n}{3n+2} = \frac{1}{3} < 1$

$\therefore$ Menurut Teorema Uji Akar, deret $\sum_{n=1}^{\infty} \left(\frac{n}{3n+2}\right)^n$ konvergen ||

7.] $\sum_{n=2}^{\infty} \left(\frac{1}{\ln n}\right)^n$

Uji akar

untuk $n \geq 2$ maka $a_n = \left(\frac{1}{\ln n}\right)^n$ positif.

Karena $\lim_{n \to \infty} (a_n)^{1/n} = \lim_{n \to \infty} \left(\left(\frac{1}{\ln n}\right)^n\right)^{\frac{1}{n}}$

$= \lim_{n \to \infty} \frac{1}{\ln n} = 0 < 1$

Maka menurut uji akar deret $\sum_{n=2}^{\infty} \left(\frac{1}{\ln n}\right)^n$ konvergen //

$a_{n+1} < a_n$

$\frac{n+1}{n+2} < \frac{n}{n+1}$

$n^2 + 2n + 1 < n^2 + 2n$ (salah)

- Cek nilai limitnya:

$\lim_{n \to \infty} a_n = \lim_{n \to \infty} \frac{n}{n+1} = 1 \neq 0$

$\sum u_n$ divergen menurut uji ganti tanda

Uji Kedivergenan pada $\sum |u_n|$

$\lim_{n \to \infty} |u_n|$

$\lim_{n \to \infty} \left| (-1)^{n+1} \frac{n}{n+1} \right|$

$\lim_{n \to \infty} \frac{n}{n+1}$

$= 1 \neq 0$

$\sum |u_n|$ divergen menurut uji kedivergenan

Karena $\sum |u_n|$ divergen dan $\sum u_n$ divergen, maka

$\sum_{n=1}^{\infty} (-1)^{n+1} \cdot \frac{n}{n+1}$ divergen

KOALA

9. $\sum_{n=1}^{\infty} \sin \frac{n!}{n^2}$

Jawab:

$U_n = \sin \frac{n!}{n^2}$ → berfluktuasi diantara $(-1,1)$, sehingga divergen

$|U_n| = \left|\sin\left(\frac{n!}{n^2}\right)\right|$ → berfluktuasi diantara $(0,1)$ sehingga divergen

Karena U_n dan $|U_n|$ divergen, maka $\sum_{n=1}^{\infty} \sin \frac{n!}{n^2}$ divergen

10. $\sum_{n=1}^{\infty} \left(-\frac{4}{3}\right)^n = \sum_{n=1}^{\infty} (-1)^n \left(\frac{4}{3}\right)^n \Rightarrow a_n = \left(\frac{4}{3}\right)^n$

⇒ Uji Banding Mutlak

$\Rightarrow \lim_{n\to\infty} \frac{(|a_{n+1}|)}{|a_n|} = \rho$

$\Rightarrow \rho = \lim_{n\to\infty} \left(\frac{4}{3}\right)^{n+1} \cdot \left(\frac{3}{4}\right)^n$

$= \lim_{n\to\infty} \left(\frac{4}{3}\right)^n \cdot \frac{4}{3} \cdot \left(\frac{3}{4}\right)^n = \lim_{n\to\infty} (1)^n \cdot \frac{4}{3}$

$= \frac{4}{3} > 1 \Rightarrow$ divergen

⇒ maka $\sum_{n=1}^{\infty} \left(-\frac{4}{3}\right)^n$ adalah divergen