# TUGAS KELOMPOK

# RESPONSI 5

## Kelompok 9:


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

↳ Untuk $n \geqslant 3$

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

$$\sum_{n=1}^{\infty} \frac{3}{n} = 3 \sum_{n=1}^{\infty} \frac{1}{n}$$ ⇝ Deret Harmonik (DIVERGEN)

∴ Berdasarkan Uji Banding (2), deret $\sum_{n=1}^{\infty} \frac{3n+1}{n^2-4}$ divergen.

2. $\sum_{n=1}^{\infty} \frac{n}{n^2+2n-3} \Leftrightarrow \frac{n}{n^2} \Leftrightarrow \frac{1}{n}$ → harmonik (divergen)

$$L = \lim_{n \to \infty} \frac{a_k}{b_k}$$

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

$$= \lim_{n \to \infty} \frac{n^2}{n^2+2n-3}$$

$$= 1 > 0 \quad \text{(divergen)}$$

$\boxed{3}$ $\sum_{n=1}^{\infty} \frac{n!}{n^{100}}$ (Pakai uji hasil bagi / Rasio) $\longrightarrow a_n = \frac{n!}{n^{100}}$

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

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

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

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

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

$$= \infty \cdot 1$$

$\rho = \infty \longrightarrow \rho = \infty > 1$ maka divergen

$\boxed{4}$ $\sum_{n=1}^{\infty} \frac{3^k + k}{k!}$

uji hasil bagi

$\lim_{n \to \infty} \frac{3^{k+1} + k+1}{(k+1)!} \times \frac{k!}{3^k + k}$

$\lim_{n \to \infty} \frac{3 \cdot 3^k + (k+1)}{(k+1)\ (3^k + k)}$

$\lim_{n \to \infty} \frac{3 \cdot 3^k + (k+1)}{(k+1)\, 3^k + k(k+1)}$

$\lim_{n \to \infty} \frac{1}{k+1} \times \frac{3 \cdot 3^k + k+1}{3^k + k}$

$\lim_{n \to \infty} \frac{1}{k+1} \times \frac{3 + \frac{k}{3^k} + \cancel{\frac{1}{3^k}}}{1 + \cancel{\frac{k}{3^k}}}$

$= 0 \times \frac{3 + 0 + 0}{1 + 0}$

$= 0 \Rightarrow < 1$, maka konvergen

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

↳ uji banding limit

$a_n = \frac{3n+1}{n^2-4}$ $\quad b_n = \frac{3n}{n^2} = \frac{3}{n}$

↳ harmonik (divergen)

$\lim_{n \to \infty} \frac{a_n}{b_n} = \lim_{n \to \infty} \frac{\frac{3n+1}{n^2-4}}{3/n} = \lim_{n \to \infty} \frac{3n^2+n}{3n^2-12}$

$= 1$

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

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

$$= \lim_{n \to \infty} \frac{n}{3n+2} = \frac{1}{3} < 1 \text{ (Konvergen)}$$

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



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

- Uji akar

$$R = \lim_{n \to \infty} \left(\left(\frac{1}{\ln n}\right)^n\right)^{1/n} = \lim_{n \to \infty} \frac{1}{\ln n} = 0$$

$\therefore 0 < 1$

maka $\sum_{n=2}^{\infty} \left(\frac{1}{\ln n}\right)^n$ Konvergen

$\boxed{8.}$ $\sum_{n=1}^{\infty} (-1)^{n+1} \frac{n}{n+1}$

$\hookrightarrow u_n = (-1)^{n+1} \frac{n}{n+1}$

$a_n = \frac{n}{n+1}$

$a_{n+1} = \frac{n+1}{(n+1)+1} = \frac{n+1}{n+2}$

$\frac{a_n}{a_{n+1}} = \frac{n/n+1}{n+1/n+2}$

$= \frac{1}{n^2+3n+2} < 1 \rightsquigarrow$ NAIK

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

$L.H = \lim_{n\to\infty} \frac{1}{1}$

$= 1$

$\therefore$ Menurut Uji Ganti Tanda, deret $\sum_{n=1}^{\infty} (-1)^{n+1} \frac{n}{n+1}$ divergen.

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

$$\left|\frac{a_{n+1}}{a_n}\right| = \left|\frac{(n+1)!}{(n+1)^2} \cdot \frac{n^2}{n!}\right|$$

$$= \left|\frac{\cancel{(n+1)} \cdot n^2}{(n+1)^{\cancel{2}}}\right| = \left|\frac{n^2}{n+1}\right|$$

$$= \frac{|n^2|}{|n+1|} = \frac{|n|^2}{|n+1|}$$

$$\lim_{n\to\infty} \frac{n^2}{n+1}$$

atas bawah sama² dibagi n

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

$$= \frac{\infty}{1+\frac{1}{\infty}} = \frac{\infty}{1} = \infty \longrightarrow \underline{\text{DIVERGEN}}$$

Diketahui nilai $|a_n|$ = <u>DIVERGEN</u>, dan

$\left|\sin \frac{n!}{n^2}\right| \rightarrow$ berfluktuasi pada range / diantara nol hingga satu $\rightarrow$ <u>divergen</u>.

Karena $|a_n| \rightarrow$ divergen, maka nilai dari

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

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

Uji ganti tanda

$\lim_{n \to \infty} a_n$

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

$= \infty \rightarrow$ divergen karena $\neq 0$

$\Sigma \left(-\frac{4}{3}\right)^n$