JAWABAN TUGAS KELOMPOK R4

MAT 1211 KALKULUS II SEMESTER GANJIL 2022/2023

Dosen:

Prof. Dr. Toni Bakhtiar S.Si., M.Sc.

KELOMPOK 05

No	Nama	NIM
1	Cahyani Dyah Rofiana	G1401211005
2	Farhan Abdillah Harahap	G1401211007
3	Syifa Khairunnisa	G1401211012
4	Akmal Basis Jatining Kusumah	G1401211036
5	Raziqizzan Putrandi	G1401211040
6	Reyzha Siva Dewi	G1401211074
7	Windi Gunawan	G1401211082
8	Hilmi Awfa Abrar	G1401211089
9	Yasmin Azzahra	G1401211100

IPB UNIVERSITY

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1. $\sum_{k=1}^{\infty} \left(\frac{1}{7}\right)^k = \frac{1}{7} + \frac{1}{7^2} + \frac{1}{7^3} + \dots$

$a = \frac{1}{7}$, $r = \frac{1}{7}$

karena $-1 < r < 1$ maka deret tersebut konvergen dengan

$s = \frac{a}{1-r} = \frac{1/7}{1-1/7} = \frac{1}{6}$

2. $\sum_{k=1}^{\infty} \frac{k^2-5}{k+2}$ → Uji kedivergenan

$\lim_{k \to \infty} a_n = \lim_{k \to \infty} \frac{k^2-5}{k+2}$

$= \lim_{k \to \infty} \frac{k^2-5}{k+2} \cdot \frac{1}{k}$

$= \lim_{k \to \infty} \frac{k^2-5}{k^2+2}$

$= 1$ → ($\lim_{k \to \infty} a_n \neq 0$ → deret divergen)

3.

$$\sum_{k=1}^{\infty} \frac{2}{3k}$$

$$= \frac{2}{3} \cdot \sum \frac{1}{k}$$ Divergen

($1/k$ deret harmonik dan selalu divergen maka $\sum_{k=1}^{\infty} \frac{2}{3k}$ divergen)

4.

$$\sum_{k=2}^{\infty} \left(\frac{1}{k} - \frac{1}{k-1}\right)$$

$$\rightarrow \left(\frac{1}{2} - \frac{1}{1}\right) + \left(\frac{1}{3} - \frac{1}{2}\right) + \left(\frac{1}{4} - \frac{1}{3}\right) + \dots + \left(\frac{1}{k} - \frac{1}{k-1}\right)$$

$$-1 + \left(\frac{1}{2} - \frac{1}{2}\right) + \left(\frac{1}{3} - \frac{1}{3}\right) + \dots + \frac{1}{k}$$

$$\lim_{k \to \infty} -1 + \frac{1}{k} = -1$$ (konvergen) //

5. Gunakan uji integral untuk menentukan kekonvergenan kedivergenan deret berikut.

$$\sum_{k=0}^{\infty} \frac{1}{k+3}$$

$$\to \int_0^{\infty} \frac{1}{k+3}\,dk = \lim_{b\to\infty} \int_0^{b} \frac{1}{k+3}\,dk$$

*misal $u = k+3$

$du = dk$

batas:

$b \to b+3$

$0 \to 0+3 = 3$

$$= \lim_{b\to\infty} \int_3^{b+3} \frac{1}{u}\,du$$

$$= \lim_{b\to\infty} \left(\ln|u| \right|_3^{b+3}$$

$$= \lim_{b\to\infty} \left(\ln|b+3| - \ln|3| \right)$$

$$= \infty \text{ (Divergen)}$$

$\therefore \sum_{k=0}^{\infty} \frac{1}{k+3}$ divergen

6. $\sum_{k=1}^{\infty} \frac{3}{2k-3}$

$= \int_1^{\infty} \frac{2}{2k-3}\,dx = \lim_{b\to\infty} \int_1^{b} \frac{2}{2k-3}\,dx$

Misal : $u = 2k-3$

$\frac{du}{dx} = 2$

$du = 2\,dx$

$= \lim_{b\to\infty} \int_{-1}^{2b-3} \frac{1}{u}\,du$

$= \lim_{b\to\infty} \left(\ln|u| \Big|_{-1}^{2b-3} \right.$

$= \lim_{b\to\infty} \ln|2b-3| - \ln|-1|$

$= \infty$ (divergen)

Karena $\int_1^{\infty} \frac{3}{2k-3}\,dx$ divergen, maka $\sum_{k=1}^{\infty} \frac{3}{2k-3}$ juga divergen.

7. $\sum_{k=0}^{\infty} \frac{k}{k^2+3}$

Jawab: Syarat uji integral : (+) $f(x)$ kontinu : ya

(+) $f(x)$ positif : ya

(+) tak naik : ya

$= \lim_{b\to\infty} \int_0^{b} \frac{x}{x^2+3}\,dx$

misal $u = x^2+3$

$du = 2x\,dx$

$\frac{1}{2}du = x\,dx$

$= \lim_{b\to\infty} \frac{1}{2} \int_3^{b^2+3} \frac{1}{u}\,du$

$= \lim_{b\to\infty} \frac{1}{2} \left(\ln|u| \Big|_3^{b^2+3} \right.$

$= \lim_{b\to\infty} \frac{1}{2} \left(\ln|b^2+3| - \ln|3| \right)$

$= \infty$ divergen

8. Gunakan uji integral untuk menentukan kekonvergenan atau kedivergenan deret berikut.

8) $\sum_{K=1}^{\infty} \frac{3}{2K^2+1}$

$\hookrightarrow \int_1^{\infty} \frac{3}{2K^2+1} = \lim_{b \to \infty} \int_1^{b} \frac{3}{2K^2+1}$

$= \lim_{b \to \infty} \left. \frac{3\sqrt{2} \tan^{-1} \sqrt{2} K}{2} \right|_1^b$

$= \lim_{b \to \infty} \frac{3\sqrt{2} \tan^{-1} \sqrt{2} (b)}{2} - \frac{3\sqrt{2} \tan^{-1} \sqrt{2} (1)}{2}$

$= \frac{3\sqrt{2}\pi - 6\sqrt{2} \tan^{-1} \sqrt{2}}{4}$

$\hookrightarrow$ Konvergen