KELOMPOK 8

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(1) $\sum_{k=1}^{\infty} \left(\frac{1}{7}\right)^k$

$$S_n = \frac{1}{7} + \frac{1}{7^2} + \frac{1}{7^3} + \dots + \frac{1}{7^k}$$

$$\frac{1}{7} S_n = \frac{1}{7^2} + \frac{1}{7^3} + \dots + \frac{1}{7^k} + \frac{1}{7^{k+1}} \quad -$$

$$\frac{6}{7} S_n = \frac{1}{7} - \frac{1}{7^{k+1}}$$

$$S_n = \left(\frac{1}{7} - \frac{1}{7^{k+1}}\right) \times \frac{7}{6}$$

$$= \frac{1}{6}\left(1 - \frac{1}{7^k}\right)$$

$$\lim_{k \to \infty} \frac{1}{6}\left(1 - \frac{1}{7^k}\right) = \frac{1}{6}\left(1 - \frac{1}{7^\infty}\right)$$

$$= \frac{1}{6} \text{ (konvergen)}$$

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

$$\stackrel{*}{=} \lim_{k \to \infty} \frac{k - \frac{5}{k}}{1 + \frac{2}{k}}$$

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

(3) $\sum_{k=1}^{\infty} \frac{2}{3k} = \frac{2}{3} \sum_{k=1}^{\infty} \frac{1}{k} \to$ divergen

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

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

$$= \frac{-1}{k^2-k}$$

$\left\{-\frac{1}{2}, -\frac{1}{6}, -\frac{1}{12}, \dots\right\}$

$$\sum_{k=2}^{\infty}\left(\frac{1}{k}-\frac{1}{k-1}\right) = \left(\left(\frac{1}{2}-1\right)+\left(\frac{1}{3}-\frac{1}{2}\right)+\left(\frac{1}{4}-\frac{1}{3}\right)+\dots+\left(\frac{1}{k}-\frac{1}{k-1}\right)\right)$$

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

$$= \frac{1}{k}-1$$

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

Gunakan uji integral untuk menentukan kekonvergenan atau kedivergenan deret berikut.

5. $\sum_{k=0}^{\infty} \frac{1}{k+3} = \int_0^{\infty} \frac{1}{k+3}\, dk$

misal:

$k+3 = u$

$du = dk$

$= \lim_{b \to \infty} \int_0^b \frac{1}{u}\, du$

$= \lim_{b \to \infty} (\ln |u| \,|_0^b$

$= \lim_{b \to \infty} (\ln |k+3| \,|_0^b$

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

6. $\sum_{k=1}^{\infty} \frac{3}{2k-3} = \int_1^{\infty} \frac{3}{2k-3}\, dk$

misal:

$2k-3 = u$

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

$= \lim_{b \to \infty} \int_1^b \frac{3}{u} \cdot \frac{du}{2}$

$= \lim_{b \to \infty} \frac{3}{2} (\ln (u) \,|_1^b$

$= \frac{3}{2} \lim_{b \to \infty} (\ln (2k-3) \,|_1^b$

$= \frac{3}{2} \lim_{b \to \infty} (\ln (2b-3) - \ln (1)) = 1$ (divergen)

7. $\sum_{k=0}^{\infty} \frac{k}{k^2+3} = \int_0^{\infty} \frac{k}{k^2+3}\, dk$

misal:

$k^2+3=u$

$dk = \frac{du}{2k}$

$= \lim_{b\to\infty} \int_0^b \frac{k}{u} \cdot \frac{du}{2k}$

$= \lim_{b\to\infty} \int_0 \frac{du}{2}$

$= \frac{1}{2} \lim_{b\to\infty} (\ln(u)) \Big|_0^b$

$= \frac{1}{2} \lim_{b\to\infty} (\ln(k^2+3)) \Big|_0^b$

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

8. $\sum_{k=1}^{\infty} \frac{3}{2k^2+1} = \int_1^{\infty} \frac{3}{2k^2+1}\, dk$

$= \lim_{b\to\infty} \int_1^b \frac{3}{2k^2+1}\, dk$

$= \lim_{b\to\infty} \int_1^b \frac{3}{2} \left(\frac{1}{k^2+\frac{1}{2}}\right)$

$= \lim_{b\to\infty} \frac{3}{2} \cdot \frac{\tan^{-1} \cdot \frac{k}{\sqrt{2}}}{\sqrt{\frac{1}{2}}} \Big|_1^a$

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

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

$= 2{,}997$ (konvergen)