KELOMPOK 8

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1. $a_n = \dfrac{n}{3n-1}$

* Kekonvergenan

$\lim\limits_{n\to\infty} \dfrac{n}{3n-1} \overset{LH}{=} \dfrac{1}{3} \to$ konvergen

* Kemonotonan

$a_n - a_{n+1} = \dfrac{n}{3n-1} - \dfrac{n+1}{3(n+1)-1}$

$= \dfrac{n}{3n-1} - \dfrac{n+1}{3n+3-1}$

$= \dfrac{n}{3n-1} - \dfrac{n+1}{3n+2}$

$= \dfrac{n(3n+2) - (n+1)(3n-1)}{(3n-1)(3n+2)}$

$= \dfrac{3n^2+2n - (3n^2+3n-n-1)}{9n^2+6n-3n-2}$

$= \dfrac{3n^2+2n-3n^2-2n+1}{9n^2+3n-2}$

$= \dfrac{1}{9n^2+3n-2} > 0$ Turun

2. $a_n = \dfrac{n^3+3n^2+3n}{(n+1)^3}$

* Kekonvergenan

$\lim\limits_{n\to\infty} \dfrac{n^3+3n^2+3n}{(n+1)^3} = \lim\limits_{n\to\infty} \dfrac{3n^2+6n+3}{3(n+1)^2}$

$= \lim\limits_{n\to\infty} \dfrac{3n^2+6n+3}{3(n^2+2n+1)}$

$= \lim\limits_{n\to\infty} \dfrac{3n^2+6n+3}{3n^2+6n+3}$

$= 1 \to$ konvergen

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* Kemonotonan

$$= \frac{n^3+3n^2+3n}{(n+1)^3} - \frac{(n+1)^3+3(n+1)^2+3(n+1)}{(n+1+1)^3}$$

$$= \frac{n^3+3n^2+3n}{(n+1)^3} - \frac{(n+1)^3+3(n+1)^2+3(n+1)}{(n+2)^3}$$

$$= \frac{(n^3+3n^2+3n)(n+2)^3 - [(n+1)^3+3(n+1)^2+3(n+1)](n+1)^3}{(n+1)^3 (n+2)^3}$$

$$= \frac{-3n^2-9n-7}{(n^2+3n+2)^3} < 0 \quad \text{naik}$$

3. $a_n = \frac{\cos(n\pi)}{n} \rightarrow -1 \leq \cos n\pi \leq 1 \rightarrow \frac{-1}{n} \leq \frac{\cos n\pi}{n} \leq \frac{1}{n}$

* Kekonvergenan

$\lim\limits_{n\to\infty} \frac{-1}{n} = 0 \rightarrow \lim\limits_{n\to\infty} \frac{1}{n} = 0 \Rightarrow$ konvergen ke 0

* Kemonotonan

$$= \frac{\cos n\pi}{n} - \frac{\cos(n+1)\cdot\pi}{n+1}$$

$$= \frac{(n+1)(\cos n\pi) - [\cos(n+1)\pi]\cdot n}{n^2+n} \Rightarrow \text{tidak naik dan tidak turun}$$

4. $a_n = e^{-n} \sin n$

* Kekonvergenan

$\lim\limits_{n\to\infty} (e^{-n} \sin(n)) = \lim\limits_{n\to\infty^+} \left(\frac{\sin(n)}{e^n}\right) = 0$ (konvergen)

* Kemonotonan

$$e^{-n}\sin(n) = e^{-(n+1)} \cdot \sin(n+1)$$

$$= e^{-n-1} \cdot \sin(n+1)$$

$$= \frac{e\sin(n) - \sin(n+1)}{e^{n+1}} > 0 \quad \text{Turun}$$

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5. $a_n = \frac{1}{n^3}$

* Kekonvergenan.

$\lim_{n \to \infty} \frac{1}{n^3} = 0$ (konvergen)

* Kemonotonan

$\frac{a_n}{a_{n+1}} = \frac{\frac{1}{n^3}}{\frac{1}{(n+1)^3}} = \frac{(n+1)^3}{n^3} = \frac{n^3+3n^2+3n+1}{n^3}$

$= 1 + \left(\frac{3n^2+3n+1}{n^3}\right) > 1$ turun

Carilah Rumus Eksplisit

6. $\frac{1}{2^2}, \frac{1}{2^3}, \frac{1}{2^4}, \ldots$

$U_n = a \cdot r^{n-1}$

$= \frac{1}{2^2} \cdot \left(\frac{1}{2}\right)^{n-1}$

$= \frac{1}{2^2} \cdot \frac{1}{2^{n-1}}$

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

$\lim_{n \to \infty} \frac{1}{2^{n+1}} = 0$ (konvergen)

7. $\sin 1, 2 \sin \frac{1}{2}, 3 \sin \frac{1}{3}, 4 \sin \frac{1}{4}, \ldots$

$a_n = n \cdot \sin \frac{1}{n}$; $n = 1, 2, 3, \ldots$

* kekonvergenan

$\lim_{n \to \infty} n \cdot \sin \frac{1}{n} \to \lim_{t \to 0} \frac{1}{t} \cdot \sin t = 1$

$\therefore a_n = n \cdot \sin \frac{1}{n} = 1$ (konvergen

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8\. $0,1,0,11,0,111,0,1111,\ldots$

$\frac{1}{9}\left[1-\left(\frac{1}{10}\right)^n\right]$ $\leftarrow$ $LD = \frac{1}{9}(0,9;0,99;0,999;\ldots)$

$= \frac{1}{9}(1-0,1;1-0,01;1-0,001;\ldots)$

* Kekonvergenan

$$\lim_{n\to\infty}\frac{1}{9}\left(1-\left(\frac{1}{10}\right)^n\right) = \frac{1}{9}(1-0) = \frac{1}{9} \rightarrow \text{konvergen}$$