-Kelompok 10-
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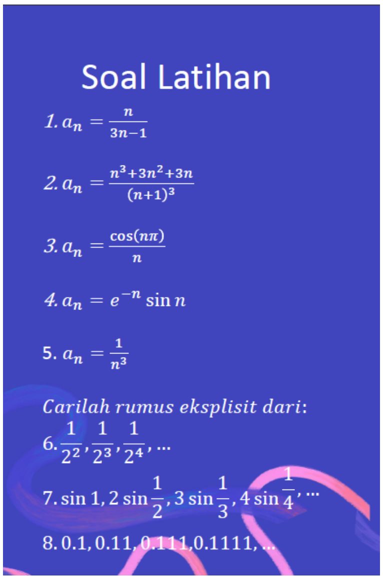

Jawab:

1.

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

➢ Kekonvergenan

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

➢ Kemonotonan

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

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

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

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

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

$$= \frac{1}{9n^2 + 3n - 2} > 0 \text{ (Monoton Turun)}$$

2.

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

- **kekonvergenan**

$$\lim_{n\to\infty} \frac{n^3+3n^2+3n}{(n+1)^3}$$

$$\lim_{n\to\infty} \frac{3n^2+6n+3}{3(n+1)^2}$$

$$\lim_{n\to\infty} \frac{3n^2+6n+3}{3n^2+6n+3} = 1\ (konvergen)$$

- **kemonotonan**

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

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

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

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

3.

$$3.\ a_n = \frac{\cos n\pi}{n}$$

$$-1 \leq \cos n\pi \leq 1$$

$$-\frac{1}{n} \leq \frac{\cos n\pi}{n} \leq \frac{1}{n}$$

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

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

Maka konvergen ke 0

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

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

= tidak naik dan tidak turun

2.

4.) Kekonvergenan

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

$$-e^{-n} \leq e^{-n} \sin n \leq e^{-n}$$

Menggunakan teorema apit :

$$\lim_{n\to\infty} (e^{-n} \sin(n)) = \lim_{n\to\infty} \left(\frac{\sin(n)}{e^{n}}\right) = 0$$ **(konvergen)**

Kemonotonan

$$\frac{a_{n+1}}{a_n} = \frac{e^{-n-1}\sin(n+1)}{e^{-n}\sin(n)} = \frac{\sin(n)\cos(1) + \sin(1)\cos(n)}{e\sin(n)} = \frac{\cos(1)}{e} + \frac{\sin(1)\cot(n)}{e}$$

Menghasilkan nilai antara minus tak hingga sampai tak hingga, maka a_n **bukan barisan monoton.**

5.

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

Kekonvergenan:

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

$\frac{1}{n^3} \to 0$ (KONVERGEN)

Kemonotonan:

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

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

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

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

6.

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

Rumus empiris:

$$U_n = a.r^{n-1}$$

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

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

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

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

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

6.

7. Carilah rumus eksplisit dari barisan bilangan : $sin 1, 2sin\frac{1}{2}, 3sin\frac{1}{3}, 4sin\frac{1}{4}, \ldots$.

a. Rumus eksplisit = $a_n = n\ sin\ \frac{1}{n}$

b. Kekonvergenan :

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

Sehingga $a_n = n\ sin\ \frac{1}{n}$ konvergen menuju ke 1

8.

Carilah rumus eksplisit dari:

8. 0.1, 0.11, 0.111, 0.1111….

a. Rumus eksplisit: $a_n = \frac{1-10^{-n}}{9}$

b. Kekonvergenan:

$$= \lim_{n\to\infty} \frac{1-10^{-n}}{9}$$

$$= \frac{1-10^{-\infty}}{9} = \frac{1}{9}\ \text{(konvergen)}$$