SOAL RESPONSI MINGGU Ke - 3

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

$\frac{1}{2}, \frac{2}{5}, \frac{3}{8}, \frac{4}{11}, \frac{5}{14}$ $\quad \lim_{n\to\infty} \frac{n}{3n-1} = \frac{1}{3} \to$ konvergen

0,5 ; 0,4 ; 0,375 ; 0,36

$a_n > a_{n+1} \to a_n - a_{n+1} = \frac{n}{3n-1} - \frac{(n+1)}{3(n+1)-1} = \frac{n}{3n-1} - \frac{n+1}{3n+2} = \frac{n(3n+2)-(n+1)(3n-1)}{(3n-1)(3n+2)}$

$= \frac{1}{9n^2+3n-2} > 0$ turun

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

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

$(n+1+1)^3 \to (n+2)^3$

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

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

3) $a_n = \frac{\cos(n\pi)}{n}$

$-1, \frac{1}{2}, 1, \frac{-1}{3}$

$-1 \le \cos n\pi \le 1$

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

$\left.\begin{array}{l} \lim_{n\to\infty} \frac{-1}{n} = 0 \\ \lim_{n\to\infty} \frac{1}{n} = 0 \end{array}\right\}$ konvergen ke 0

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

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

tidak naik dan tidak turun

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

$\lim_{n\to\infty} e^{-n}\sin n = \lim_{n\to\infty} \left(\frac{1}{e^n} \sin n\right)$

0,3 ; 0,12 ; 0,007 ; -0,01

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

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

$-1 \le \sin n \le 1$

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

$\left.\begin{array}{l} \lim_{n\to\infty} -e^{-n} = 0 \\ \lim_{n\to\infty} e^{-n} = 0 \end{array}\right\}$ konvergen ke 0

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

$1, \frac{1}{8}, \frac{1}{27}, \frac{1}{64}$

turun

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

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

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

$= \frac{3n^2 + 3n + 1}{(n+1)^3} > 0$ turun

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

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

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

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

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

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

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

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

$\lim_{n\to\infty} n \sin \frac{1}{n}$

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

konvergen ke 1

8) $0,1 ; 0,11 ; 0,111 ; 0,1111$

rumus : $\frac{1}{9}\left[1 - \left(\frac{1}{10}\right)^n\right]$

$\frac{1}{9}(0,9, 0,99, 0,999)$

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

$\frac{1}{9}\left(1 - \left(\frac{1}{10}\right)^n\right)$

konvergen : $\lim_{n\to\infty} \frac{1}{9}\left[1 - \left(\frac{1}{10}\right)^n\right]$

$= \lim_{n\to\infty} \frac{1}{9}(1-0)$

$= \frac{1}{9} \to$ konvergen

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