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1. $\sum_{n=0}^{\infty} \frac{(x-1)^n}{(n+1)^2}$

$\lim_{n\to\infty} \frac{(x-1)^{n+1}}{(n+2)^2} \cdot \frac{(n+1)^2}{(x-1)^n} = \frac{(x-1)(n+1)^2}{(n+2)^2}$

$(x-1) \cdot \lim_{n\to\infty} \frac{n^2+2n+1}{n^2+4n+4} = \frac{n^2(1+\frac{2}{n}+\frac{1}{n^2})}{n^2(1+\frac{4}{n}+\frac{4}{n^2})} = 1$

$\Rightarrow |(x-1)| < 1$

$0 < x < 2 \to$ uji $x = 2$

uji $x = 0$

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

- uji banding limit

$L = \lim_{n\to\infty} \frac{(1)^n}{(n+1)^2} \cdot \frac{n^2}{(1)^n} = \frac{n^2}{n^2+2n+2} \to$ konvergen untuk $x=2$

$\to \sum_{n=0}^{\infty} \frac{(-1)^n}{(n+1)^2} \to$ uji DGT

(i) $\frac{a_n}{a_{n+1}} = \frac{1}{(n+1)^2} \cdot \frac{(n+2)^2}{1} = \frac{(n+2)^2}{(n+1)^2} > 1 \to$ Syarat terpenuhi

(ii) $\lim_{n\to\infty} \frac{1}{(n+1)^2} = \frac{1}{\infty} = 0 \to$ 2 Syarat terpenuhi maka $x=0$ konvergen

HK = [0,2]

2. $\sum_{n=0}^{\infty} \frac{(x+2)^n}{(n+1)3^n}$

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

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

$\Rightarrow \left|\frac{(x+2)}{3}\right| < 1$

$\to (x+2+3)(x+2-3) < 0$

$(x+5)(x-1) < 0$

+ | − | + (−5, 1)

$-5 < x < 1$

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•) Uji $x = -5$

$$\sum_{n=0}^{\infty} \frac{(-3)^n}{(n+1)3^n} = \frac{(-1)^n (3)^n}{(n+1)3^n}$$

$$= \frac{a_n}{a_{n+1}} = \frac{n+2}{n+1} > 1 \rightarrow, a_n \text{ monoton turun}$$

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

• maka konvergen untuk $x = -5$

•) Uji $x = 1$

$$\sum_{n=0}^{\infty} \frac{(3)^n}{(n+1)3^n} = \frac{1}{(n+1)}$$

• Uji banding limit

$L = \lim_{n \to \infty} \frac{n}{n+1} = 1 \rightarrow$ karena b_n divergen dan $L = 1$, maka untuk $x = 1$ divergen

HK $= [-5, 1]$

3. $$\sum_{n=1}^{\infty} \frac{(-1)^n x^n}{n^{2n}}$$

• Mencari selang

$$P = \lim_{n \to \infty} \frac{x^{n+1}}{(n+1)2^{n+1}} \cdot \frac{n \cdot 2^n}{x^n}$$

$$P = x \lim_{n \to \infty} \frac{n}{2n+2} = \left|\frac{x}{2}\right| < 1 \qquad -2 < x < 2$$

•) Uji $x = -2$

$$\sum_{n=1}^{\infty} \frac{(-1)^n (-2)^n}{n \cdot 2n} = \frac{(-1)^n (-1)^n (2)^n}{n \cdot 2^n} = \frac{1}{n} \rightarrow \text{Divergen untuk } x = -2$$

•) Uji $x = 2$

$$\sum_{n=0}^{\infty} \frac{(-1)^n 2^n}{n\, 2^n}$$

• Uji DGT

(i) $\frac{a_n}{a_{n+1}} = \frac{n+1}{n} > 1 \rightarrow a_n$ monoton turun

(ii) $\lim_{n \to \infty} \frac{1}{n} = \frac{1}{\infty} = 0 \rightarrow$ maka konvergen untuk $x = 2$

HK $= (-2, 2]$

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4. $\sum_{n=0}^{\infty} \frac{(x-1)^{2n}}{4^n}$

• Mencari Interval

$P = \lim_{n\to\infty} \frac{(x-1)^{2n+2}}{4^{n+1}} \cdot \frac{4^n}{(x-1)^{2n}}$

$P = (x-1)^2 \lim_{n\to\infty} \frac{1}{4}$

$|(x-1)^2| < 4$

$|x^2-2x+1| < 4$

$-4 < x^2-2x+1 < 4$

$x^2-2x+1 < 4$

$x^2-2x-3 < 0$

$(x-3)(x+1)$

$+ \quad - \quad +$

$-1 \qquad 3$

$-1 < x < 3$ ... (1)

$x^2-2x+1 > -4$

$x^2-2x+5 > 0$

$x = \frac{2 \pm \sqrt{4-4(1)(5)}}{2}$

$= \frac{2 \pm \sqrt{4-20}}{2}$ ... (2)

• Uji $x=-1$

$\sum_{n=0}^{\infty} \frac{(-2)^{2n}}{4^n} = \frac{(-1)^{2n}(2)^{2n}}{4^n} = \frac{(-1)^{2n}(2)^{2n}}{2^{2n}} = (-1)^{2n} \to$ Divergen, karena $\lim a_n \neq 0$

• Uji $x=3$

$\sum_{n=0}^{\infty} \frac{(2)^{2n}}{4^n} = \frac{2^{2n}}{(2)^{2n}} = 1 \to$ Divergen, karena $a_n \neq 0$

HK = $(-1, 3)$

5. $\sum_{n=1} \frac{(-2)^n (2x+1)^n}{n^2} = \frac{(-1)^n (2)^n (2x+1)^n}{n^2}$

• Mencari Selang

$P = \lim_{n\to\infty} \frac{(2)^{n+1} (2x+1)^{n+1}}{(n+1)^2} \cdot \frac{n^2}{(2)^n (2x+1)^n} = \frac{2(2x+1)\, n^2}{(n+1)^2}$

$4x+2 \lim_{n\to\infty} \frac{n^2}{n^2+2n+2}$

$4x+2 \lim_{n\to\infty} \frac{n^2}{n^2(1+\frac{2}{n}+\frac{2}{n^2})} = 1$

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$\Rightarrow |4x+2| < 1$

$-1 < 4x+2 < 1$

$\frac{-3}{4} < x < -\frac{1}{4}$

$\Rightarrow$ uji $x = -\frac{3}{4}$

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

$\sum_{n=1}^{\infty} \frac{1}{n^2} \to$ uji deret $p=2$, $p>1$, maka konvergen

$\Rightarrow$ uji $x = -\frac{1}{4}$

$$\sum_{n=1}^{\infty} \frac{(-1)^n (2)^n (-\frac{1}{2}+1)^n}{n^2} = \frac{(-1)^n (2^n)(\frac{1}{2})^n}{n^2} = \frac{(-1)^n}{n^2} \to \text{uji DGT}$$

(i) $\frac{a_n}{a_{n+1}} = \frac{(n+1)^2}{n^2} > 1$, a_n monoton turun

(ii) $\lim_{n\to\infty} \frac{1}{n^2} = \frac{1}{\infty^2} = 0$ + 2 syarat terpenuhi, maka $\sum_{n=1}^{\infty} \frac{(-1)^n}{n^2}$ konvergen

$Hk = [-\frac{3}{4}, -\frac{1}{4}]$

6. $\sum_{n=1}^{\infty} (-1)^{n+1} \frac{(x-2)^n}{(n+1)}$

• Uji Selang

$P = \lim_{n\to\infty} \frac{(x-2)^{n+1}}{(n+2)} \cdot \frac{n+1}{(x-2)^n}$

$P = (x-2) \lim_{n\to\infty} \frac{(n+1)}{(n+2)} < 1$

$\Rightarrow |(x-2)| < 1$

$-1 < x-2 < 1$

$1 < x < 3$

$\Rightarrow$ Uji $x = 1$

$$\sum_{n=1}^{\infty} (-1)^{n+1} \frac{(-1)^n}{(n+1)} = \frac{(-1)^n (-1)^n (-1)^1}{(n+1)} = \frac{-1}{n+1}, \quad b_n = \sum_{n=1}^{\infty} \frac{-1}{n} \to \text{uji banding limit}$$

$L = \lim_{n\to\infty} \frac{-1}{n+1} \cdot \frac{n}{-1} = \frac{n}{n+1} = 1 \to$ uji hasil banding limit

→ Uji $x = 3$

$$\sum_{n=1}^{\infty} \frac{(-1)^n (-1)(1)^n}{(n+1)} = \frac{(-1)^{n+1}}{(n+1)} \rightarrow \text{uji DGT}$$

(i) $\frac{a_n}{a_{n+1}} = \frac{(n+2)}{(n+1)} > 1 =$ a_n : monoton turun

(ii) $\lim_{n \to \infty} \frac{1}{n+1} = 0$ → 2 syarat terpenuhi maka untuk $x = 3$ konvergen

$Hk = (1, 3]$

7. $\sum_{n=1}^{\infty} \frac{(x+2)^n}{n!}$ = Rumus dari deret $(x+2)$

• Uji selang

$$P = \lim_{n \to \infty} \frac{(x+2)^{n+1}}{(n+1)!} \cdot \frac{n!}{(x+2)^n}$$

$$P = |(x+2)| \lim_{n \to \infty} \frac{1}{(n+1)} = 0$$

$P = 0 < 1$, maka deret selalu konvergen untuk semua nilai x

$Hk = (-\infty, \infty) = R$