P5

When you use the Ratio test to find the interval of convergence, what are the 3 possible answers for the limit & what do they mean?

Ratio test $R = \lim_{n\to\infty} \left| \frac{a_{n+1}}{a_n} \right|$

1. ∞ $R=0$ $I=\{c\}$
2. 0 $R=\infty$ $I=(-\infty,\infty)$
3. $\#$ $R=\frac{1}{2}I$ $I=$ solve for

P6

Find the Radius of convergence & the interval of convergence for

$\sum_{n=1}^{\infty} \frac{x^n}{n!}$

$\sum_{n=1}^{\infty} \frac{x^n}{n!}$

$R = \lim_{n\to\infty} \left| \frac{x^{n+1}}{(n+1)!} \cdot \frac{n!}{x^n} \right|$

$R = \lim_{n\to\infty} \left| \frac{\cancel{x^n} \cdot x' \cdot \cancel{n!}}{\cancel{x^n}(n+1)(\cancel{n!})} \right|$

$R = \lim_{n\to\infty} \left| \frac{x}{n+1} \right|$

$R = |x| \lim_{n\to\infty} \left| \frac{1}{n+1} \right|$

$R = |x|(0) < 1$ Always

Interval: $(-\infty,\infty)$

Radius: ∞

P7

Find the Radius & Interval of convergence for

$\sum_{n=1}^{\infty} n!(2x+1)^n$

$\sum_{n=1}^{\infty} n!(2x+1)^n$ $R = \lim_{n\to\infty} \left| \frac{(n+1)!(2x+1)^{n+1}}{n!(2x+1)^n} \right|$

$R = \lim_{n\to\infty} \left| \frac{(n+1)\cancel{n!}\cancel{(2x+1)^n}(2x+1)'}{\cancel{n!}\cancel{(2x+1)^n}} \right|$

$R = |2x+1| \lim_{n\to\infty} |n+1|$

$R = |2x+1|(\infty) < 1$

when $2x+1=0$

$x=-\frac{1}{2}$

Interval: $\{-\frac{1}{2}\}$

Radius: 0

P8

Find the Radius & Interval of convergence for

$$\sum_{n=1}^{\infty} \frac{(-1)^n}{n}(x-5)^n$$

$$\sum_{n=1}^{\infty} \frac{(-1)^n}{n}(x-5)^n \quad R = \lim_{n\to\infty}\left|\frac{(x-5)^{n+1}}{n+1} \cdot \frac{n}{(x-5)^n}\right|$$

$$R = \lim_{n\to\infty}\left|\frac{\cancel{(x-5)^n}(x-5)^1\, n}{\cancel{(x-5)^n}(n+1)}\right|$$

Radius

$(4,6]$

Interval

$$R = |x-5| \lim_{n\to\infty}\left|\frac{n}{n+1}\right|$$

1

$$R = |x-5|(1) < 1 \qquad x-5<1 \text{ and } x-5>-1$$

$$x<6 \text{ and } x>4$$

$\boxed{\text{check } 4}$ $\sum_{n=1}^{\infty} \frac{(-1)^n(-1)^n}{n} = \sum_{n=1}^{\infty} \frac{1}{n}$ diverges by p series $p=1\le 1$.

$\boxed{\text{check } 6}$ $\sum_{n=1}^{\infty} \frac{(-1)^n(6-5)^n}{n} = \sum_{n=1}^{\infty} \frac{(-1)^n(1)^n}{n} = \sum_{n=1}^{\infty} \frac{(-1)^n}{n}$

converges by alternating $\frac{1}{n}$ is decreasing & $\lim_{n\to\infty} \frac{1}{n} = 0$.