$\frac{8}{36+9+2}$

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1. $$\sum_{k=1}^{\infty} \frac{k+5}{4k^2+3k+2} \approx \sum_{k=1}^{\infty} \frac{1}{k}$$

$$\frac{k+5}{4k^2+3k+2} < \frac{1}{k} \qquad \sum_{k=1}^{\infty} \frac{1}{k}$$ $p=1$, Diverges by P.S.T

$$\lim_{k\to\infty} \frac{k+5}{4k^2+3k+2} \cdot k = \lim_{k\to\infty} \frac{k^2+5k}{4k^2+3k+2} = \frac{1}{4}$$

Grow Comparably therefore $\frac{k+5}{4k^2+3k+5}$ $\boxed{\text{Diverges}}$

2. $$\sum_{k=0}^{\infty} \frac{2^{4k}}{(k+1)!} = \sum_{k=0}^{\infty} \frac{(2)^{4k}}{k!\,(k+1)}$$

$$\cancel{\lim_{k\to\infty} \left| \frac{2^{4k}}{k!\,(k+1)} \right|} \qquad \lim_{k\to\infty} \left| \frac{(2)^{4(k+1)}}{\cancel{(k+1)!}\,(k+2)} \cdot \frac{\cancel{(k+1)!}}{\cancel{2^{4k}}} \right|$$

$$= \lim_{k\to\infty} \left| \frac{16}{k+2} \right| = 0$$, Converges by Ratio

Test

$^{2}\sqrt{x}$ $\quad x^{1/2}$

$^{x}\sqrt{\ }$ $\quad x^{1/x}$ $\quad 1/0$ $\quad 1^{0} = 1$

$$\lim_{k\to\infty} \frac{(x-3)^{k+1}}{5(k+1)^{1/k+1}} \cdot$$

3.
A. $\displaystyle\sum_{k=1}^{\infty} \frac{(-1)^{k+1}(x-3)^{k}}{5^{k}\sqrt{k}}$

$$\lim_{k\to\infty} \left| \frac{(x-3)^{k}}{5^{1/k} \cdot k^{1/k}} \right|^{1/k} = \lim_{k\to\infty} \left| \frac{x-3}{5 \cdot k^{1/k^{2}}} \right|$$

$$\frac{|x-3|}{5} \lim_{k\to\infty} \left(\frac{1}{k^{1/k^{0}}} \right)$$

$$\lim_{k\to\infty} \left| \frac{\cancel{(x-3)}^{k+1}}{\cancel{5}\,\cancel{(k+1)}^{1/k}} \cdot \frac{\cancel{5}\,k^{1/k}}{\cancel{(x-3)}^{k}} \right|$$

$$= \lim_{k\to\infty} \left| \frac{(x-3)}{1^{1/k}} \right| \qquad |x-3| < 1$$

$$|x-3| \lim_{k\to\infty} \left(\frac{1}{1^{1/k}} \right) \qquad -1 < x-3 < 1$$

$$2 < x < 4$$

B. $(R = 1)$ $\quad \boxed{(2, 4)}$

Test Endpoints

convergence ?

$$x = 2 : \sum_{k=1}^{\infty} \frac{(-1)^{k+1}(2-3)^{k}}{5 \cdot k^{1/k}} \qquad x = 4 : \frac{(-1)^{k+1}(1)^{k}}{5 \cdot k^{1/k}}$$

$$= \sum_{k=1}^{\infty} \frac{(-1)^{k+1}(-1)^{k}}{5 \cdot k^{1/k}}$$ = Convergence by p series

$5x^{1/k}$

$\frac{4}{x}$ $\frac{0(x) - 1(4)}{x^2}$ $\frac{0(x^2) - 2x \cdot 4}{\cancel{x^4}}$

$8x$ $8 \frac{1}{2} x^{-1/2}$ $\frac{-4}{x^2}$

4. A. $8x^{1/2}$ $f'(x) = \frac{4}{x}$ $\frac{4}{x}$

$f''(x) = -\frac{4}{x^2}$ $f^3(x) = +\frac{8}{x^3}$

P_3 $f(1) + f'(1)(x-1) + \frac{f''(1)}{2!}(x-1)^2 + \frac{f'''(1)}{6}(x-1)^3$

$P_3 = 8 + 4(x-1) + -2(x-1)^2 + \frac{8(x-1)^3}{6}$

↑ This is my Ans

B. ?

Ignore this

$\cancel{f(1) + f'(1)(x-a)}$

$\cancel{f(1) \quad 0 + 2^1 (x-1)! (x-a)}$

$\cancel{0 + 2(x-1) + \frac{4}{2!}(x-2)^2 + \frac{16(x-1)^3}{3!}}$

$\cancel{0 + \frac{2(x-1)}{1} + \frac{4(x-2)^2}{2} + \frac{8(x-1)^3}{6\ 3}}$

Part B. $8 + 4(.95-1) - 2(.95-1)^2 + \frac{8(.95-1)^3}{6}$

↳ ?

5. $\sin x = \sum_{k=0}^{\infty} \frac{(-1)^k x^{2k+1}}{(2k+1)!}$

A

$$\frac{\sin(\pi x)}{\cancel{8}\cdot \pi x} = \sum_{k=0}^{\infty} \frac{(-1)^k (\pi x)^{2k\cancel{+1}}}{(2k+1)!}$$

B. ? I am unsure

$$\int_0^1 \frac{(-1)^k \cancel{ARAN}(\pi x)^{2k+1}}{2k(2k+1)}$$

$$\Big|_0^1 \frac{(-1)^k (\pi(1))^{2k+1}}{2k(2k+1)} - \left(\frac{(-1)^k (0)^{2k+1}}{2k(2k+1)}\right)$$

~~I have no clue~~