

⑦ Does $\sum_{n=0}^{\infty} (-1)^{n+1} \frac{4}{n^2+3}$ conv. or div.?

positive & decreasing

$$\lim_{n \rightarrow \infty} \frac{4}{n^2+3} = 0 \quad \text{Thus it } \boxed{\text{converges}}.$$

⑧ Does $\sum_{i=6}^{\infty} (-1)^i \frac{i}{\sqrt{i^3-7}}$ conv. or div.?

positive & decreasing

$$\lim_{i \rightarrow \infty} \frac{i}{\sqrt{i^3-7}} = \lim_{i \rightarrow \infty} \frac{\sqrt{i^2}}{\sqrt{i^3}} \frac{1/\sqrt{i}}{\sqrt{1-7/i^3}} = \frac{0}{\sqrt{1-0}} = 0$$

Thus it $\boxed{\text{converges}}$.

9) Does $\sum_{n=2}^{\infty} \left(-\frac{3}{5}\right)^n$ converge or diverge?

$$= \sum_{n=2}^{\infty} (-1)^n \underbrace{\left(\frac{3}{5}\right)^n}_{\substack{\text{positive \&} \\ \text{decreasing}}}$$

$$\lim_{n \rightarrow \infty} \left(\frac{3}{5}\right)^n = 0$$

Thus it converges.

10) Does $\sum_{k=2}^{\infty} \left(-\frac{5}{3}\right)^k$ converge or diverge?

~~$$= \sum_{k=2}^{\infty} (-1)^k \underbrace{\left(\frac{5}{3}\right)^k}_{\substack{\text{not} \\ \text{decreasing}}}$$~~

~~Can't use AST~~

$$= \sum_{k=2}^{\infty} \underbrace{(1)}_a \left(\underbrace{-\frac{5}{3}}_r\right)^k \leftarrow \text{Geometric Series}$$

$$|r| > 1 \quad \text{so} \quad \boxed{\text{diverges}}$$

(11) Does $\sum_{n=13}^{\infty} (-1)^n \frac{1}{n \ln n}$ Converge or diverge?

↑
positive &
decreasing

$$\lim_{n \rightarrow \infty} \frac{1}{n \ln n} = 0$$

Thus it converges.