# Infinite series

Decide whether the given series are convergent.

1.

$$\sum_{n=1}^{\infty}(-1)^n\frac{2n^2+3n+4}{2n^2+5}, \qquad \sum_{n=1}^{\infty}(-1)^n\frac{2n^2+3n+4}{(2n^2+5)^2}, \qquad \sum_{n=1}^{\infty}\frac{n^2}{n^3+1}, \qquad \sum_{n=1}^{+\infty}\frac{2^n}{n!},$$

$$\sum_{n=1}^{+\infty}\frac{(n!)^2}{(2n)!}, \qquad \sum_{n=1}^{+\infty}\frac{n!}{n^n}, \qquad \sum_{n=1}^{+\infty}\binom{2n}{n}\frac{1}{5^n}.$$

2.

$$\sum_{n=1}^{\infty}\cos(n\pi)(\sqrt{n+2}-\sqrt{n}), \qquad \sum_{n=1}^{\infty}\frac{\sqrt[3]{n^2+5}-\sqrt[3]{n^2+1}}{\sqrt[4]{n}},$$

$$\sum_{n=1}^{\infty}\frac{1}{\sqrt{2n+1}\sqrt{2n+3}}, \qquad \sum_{n=1}^{\infty}\frac{n^5}{2^n+3^n}.$$

4.

$$\sum_{n=1}^{+\infty}\frac{n!}{2^{n^2}}, \qquad \sum_{n=1}^{+\infty}(-1)^n(\sqrt[n]{3}-1), \qquad \sum_{n=3}^{+\infty}\frac{3}{2^n-2n}, \qquad \sum_{n=1}^{\infty}\frac{2^n+(-1)^nn}{3^n+(-1)^nn},$$

$$\sum_{n=1}^{+\infty}\left(\sqrt{n^3+1}-\sqrt{n^3-1}\right), \qquad \sum_{n=1}^{+\infty}\frac{\arctan n}{n}, \qquad \sum_{n=1}^{+\infty}\frac{\cos(n\pi)\sqrt{n+7}}{\sqrt{n}\sqrt{n+1}},$$

$$\sum_{n=1}^{\infty}\frac{n^5}{5^n}, \qquad \sum_{n=1}^{+\infty}\frac{3^n+4^n}{4^n+5^n}, \qquad \sum_{n=1}^{+\infty}(-1)^n\frac{\sin(n)}{n\sqrt{n}}.$$