

Determine whether or not the following series converge or diverge.
Justify your answer.

$$1. \sum_{n=1}^{\infty} \frac{n^3 + 4n + 2}{n^4 + n^2}$$

$$2. \sum_{n=1}^{\infty} \frac{n^4 + n^2}{n^3 + 4n + 2}$$

$$3. \sum_{n=1}^{\infty} \frac{n}{n^3 + 1}$$

$$4. \sum_{n=1}^{\infty} \frac{n! \ln n}{n(n+2)!}$$

$$5. \sum_{n=1}^{\infty} \frac{(-1)^n}{4^n}$$

$$6. \sum_{n=1}^{\infty} n^4 2^{-n}$$