

Find out which of the following series converge. **Your solutions must contain sentences explaining what you are doing and what tests you are using.**

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

2.
$$\sum_{n=1}^{\infty} \frac{n^n}{n!}$$

3.
$$\sum_{n=1}^{\infty} \frac{(-1)^n n^k}{1 + 2^n}$$

4.
$$\sum_{n=0}^{\infty} \frac{(n-1)(x+1)^n}{(n+1)2^n} \quad (\text{consider all possible values of } x \in \mathbf{R}).$$