Determine whether each of the following series converges or diverges. Give a detailed explanation of how you determined your answer, explicitly stating which tests you used.

1. $\sum_{n=0}^{\infty} \dfrac{(-1)^n}{4^n}$

2. $\sum_{n=1}^{\infty} \dfrac{n}{n+2}$

3. $\sum_{n=1}^{\infty} \dfrac{1}{n\sqrt{n}}$

4. $\sum_{n=1}^{\infty} \dfrac{n!}{n^n}$

5. $\sum_{n=0}^{\infty} e^{-n}$

6. $\sum_{n=1}^{\infty} \dfrac{n}{n^2+1}$

7. $\sum_{n=1}^{\infty} \dfrac{\sin^2 n}{2^n}$

8. $\sum_{n=1}^{\infty} \dfrac{(n!)^n}{(n^n)^2}$

9. $\sum_{n=1}^{\infty} \dfrac{4}{(4n-3)(4n+1)}$

10. $\sum_{n=1}^{\infty} \dfrac{1}{\sqrt{n^3+2}}$

11. $\sum_{n=1}^{\infty} \dfrac{1+\cos n}{n^2}$

12. $\sum_{n=1}^{\infty} \dfrac{1}{2n^3}$

13. $\sum_{n=1}^{\infty} \ln\left(\dfrac{1}{n}\right)$

14. $\sum_{n=1}^{\infty} \dfrac{1}{n\sqrt[n]{n}}$

15. $\sum_{n=1}^{\infty} \dfrac{1}{2n-1}$

16. $\sum_{n=1}^{\infty} \dfrac{n^2}{2^n}$

17. $\sum_{n=1}^{\infty} \cos n\pi$

18. $\sum_{n=1}^{\infty} \dfrac{1}{3^{n-1}+1}$

19. $\sum_{n=1}^{\infty} \dfrac{(n+1)(n+2)}{n!}$

20. $\sum_{n=1}^{\infty} \dfrac{n^n}{2^{n^2}}$

21. $\sum_{n=1}^{\infty} \left(1+\dfrac{1}{n}\right)^n$

22. $\sum_{n=1}^{\infty} \dfrac{10n+1}{n^3+3n^2+2n}$

23. $\sum_{n=0}^{\infty} e^{-2n}$

24. $\sum_{n=1}^{\infty} \dfrac{\tan^{-1} n}{n^2}$

25. $\sum_{n=1}^{\infty} \dfrac{1}{\sqrt{n}}$

26. $\sum_{n=1}^{\infty} \dfrac{n^n}{(2^n)^2}$

27. $\sum_{n=1}^{\infty} n^2 e^{-n}$

28. $\sum_{n=1}^{\infty} \dfrac{2^n}{n+1}$

29. $\sum_{n=1}^{\infty} \dfrac{1\cdot 3\cdot \,...\, \cdot (2n-1)}{4^n 2^n n!}$

30. $\sum_{n=2}^{\infty} \dfrac{\ln n}{n}$