Solutions

C = Converges, **D** = Diverges.

No.	Series	Best Test	C / D	Reason/Type
1.	$\sum_{n=1}^{\infty} \frac{1}{n^5}$	**P-Series Test**	**C**	$p = 5 > 1$
2.	$\sum_{n=0}^{\infty} \left(\frac{3}{2}\right)^n$	**Geometric Series Test**	**D**	$\lvert r\rvert = 3/2 \geq 1$
3.	$\sum_{n=1}^{\infty} \frac{n}{n+1}$	**Test for Divergence**	**D**	$\lim_{n\to\infty} a_n = 1 \neq 0$
4.	$\sum_{n=1}^{\infty} \frac{(-1)^{n-1}}{\sqrt{n}}$	**Alternating Series Test**	**C**	b_n is decreasing, $\lim_{n\to\infty} b_n = 0$
5.	$\sum_{n=1}^{\infty} \frac{n!}{100^n}$	**Ratio Test**	**D**	$L = \infty$
6.	$\sum_{n=1}^{\infty} \frac{1}{\sqrt[3]{n^2}}$	**P-Series Test**	**D**	$p = 2/3 \leq 1$
7.	$\sum_{n=1}^{\infty} \frac{1}{n^2+1}$	**Integral or Comparison Test**	**C**	Compare to $\sum 1/n^2$ (Convergent P-series)
8.	$\sum_{n=1}^{\infty} \frac{2^n}{n^n}$	**Root Test**	**C**	$L = \lim_{n\to\infty} \frac{2}{n} = 0 < 1$
9.	$\sum_{n=1}^{\infty} \frac{5n^2-3n}{n^3+2}$	**Limit Comparison Test**	**D**	Compare to $\sum 1/n$ (Harmonic/Divergent P-series)
11.	$\sum_{n=2}^{\infty} \frac{1}{n(\ln n)^2}$	**Integral Test**	**C**	Integral $\int_2^{\infty} \frac{1}{x(\ln x)^2} dx$ converges ($u = \ln x$)
13.	$\sum_{n=1}^{\infty} \frac{1}{n^2+5n+6}$	**Limit Comparison**	**C**	Compare to $\sum 1/n^2$; conv.
14.	$\sum_{n=1}^{\infty} \frac{e^n}{n^3}$	**Ratio Test or Divergence Test**	**D**	$\lim_{n\to\infty} a_n = \infty \neq 0$
15.	$\sum_{n=1}^{\infty} \frac{1}{n!}$	**Ratio Test**	**C**	$L = 0 < 1$
16.	$\sum_{n=1}^{\infty} \frac{\sin^2(n)}{n^2}$	**Direct Comparison Test**	**C**	$0 \leq \frac{\sin^2(n)}{n^2} \leq \frac{1}{n^2}$. Compare to $\sum 1/n^2$ (Convergent P-series)
17.	$\sum_{n=1}^{\infty} \left(\frac{n+1}{2n}\right)^n$	**Root Test**	**C**	$L = \lim_{n\to\infty} \frac{n+1}{2n} = 1/2 < 1$
18.	$\sum_{n=1}^{\infty} (-1)^n \frac{n^2}{n^3+1}$	**Alternating Series Test**	**C**	b_n is decreasing, $\lim_{n\to\infty} b_n = 0$
20.	$\sum_{n=1}^{\infty} \frac{1}{\sqrt{n^3+4}}$	**Limit Comparison Test**	**C**	Compare to $\sum 1/n^{3/2}$ (Convergent P-series)