Serie

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1) $\frac{(n!)^2}{(2n)!} = \frac{((n+1)!)^2}{(2(n+1))!} * \frac{(2n)!}{(n!)^2} = \frac{(n+1)^2 * (n!)^2}{(2n+2)(2n+1)(2n)!} * \frac{(2n)!}{(n!)^2}$

$\frac{(n+1)^2}{2(n+1)(2n+1)} = \frac{n+1}{2(2n+1)} \sim \frac{n}{4n} = \frac{1}{4}$

1/4 < 1 -> converge

2) $\frac{1}{n^{1+\frac{1}{n}}} = \frac{1}{n * n^{\frac{1}{n}}} \sim \frac{1}{n} \rightarrow diverge$

3) $\frac{n^2}{3^n} \rightarrow 0 \rightarrow converge$

4) $\left(1 - \frac{1}{n}\right)^n = e^{1*-1} = e^{-1} = \frac{1}{e}! = 0 \rightarrow diverge$

5) $\left(1 - \frac{1}{n}\right)^{n^2} = \left(\left(1 - \frac{1}{n}\right)^n\right)^n = \left(\frac{1}{e}\right)^n \rightarrow Esce\ 0, quindi\ dobbiamo\ trovare\ altro$

$\sqrt[n]{\left(\frac{1}{e}\right)^n} = \frac{1}{e} < 1 \rightarrow converge$

6) $\frac{1}{\sin^4 n} \rightarrow diverge\ siccome\ il\ limite\ non\ esiste, quindi\ mai\ 0, quindi\ per\ forza\ diverge$

7) $\frac{n!}{n^n} = \frac{(n+1)!}{(n+1)^{n+1}} * \frac{n^n}{n!} = (\dots) = \left(\frac{n}{n+1}\right)^n = \left(\frac{n+1}{n}\right)^{-n} = \left(\left(1 + \frac{1}{n}\right)^n\right)^{-1} = e^{-1} = \frac{1}{e} < 1 \rightarrow converge$

8) $\frac{1}{n^3 + 2n^2 + n} \sim \frac{1}{n^3} \rightarrow converge$