1. Each of the series is divergent, because $a_n \not\to 0$.

2. Find the sum of each series.

(a) 
$$
\sum_{n=100}^{\infty} \left(\frac{1}{3}\right)^n = \left(\frac{1}{3}\right)^{100} \sum_{n=0}^{\infty} \left(\frac{1}{3}\right)^n = \left(\frac{1}{3}\right)^{100} \cdot \frac{1}{1 - \frac{1}{3}} = \frac{1}{2} \cdot 3^{99}.
$$

(b) Since 
$$
\frac{1}{(4n-1)(4n+3)} = \frac{1}{4n-1} - \frac{1}{4n+3},
$$
we have 
$$s_n = \frac{1}{12} - \frac{1}{4n+3},$$
and hence 
$$
\sum_{n=1}^{\infty} \frac{1}{(4n-1)(4n+3)} = \frac{1}{12}.
$$

(c) Since 
$$
\frac{1}{n(n+1)(n+2)} = \frac{1}{n} - \frac{1}{n+1} + \frac{1}{n+2},
$$
we have 
$$s_n = \frac{1}{2} - \frac{1}{2} + \frac{1}{n+1} - \frac{1}{n+1} + \frac{1}{n+2},$$
and hence 
$$
\sum_{n=1}^{\infty} \frac{1}{n(n+1)(n+2)} = \frac{1}{4}.
$$

(d) 
$$
\sum_{n=1}^{\infty} \frac{3n^2 - 2}{n^4} = 3 \left(\frac{\pi^2}{6}\right) - 2 \left(\frac{\pi^4}{90}\right).
$$