nth Term Test for Divergence (ONLY)

If $\lim_{n\to\infty} a_n \neq 0$, then the series $\sum_{n=1}^{\infty} a_n$ diverges.

(think about it, it should make perfect sense!)

Note: This does **NOT** say that if $\lim_{n\to\infty} a_n = 0$, then the series **DOES** converge. This test can only be used to prove that a series diverges (hence the name.) If $\lim_{n\to\infty} a_n = 0$, then this test doesn't tell us anything, is inconclusive, doesn't work, fails, etc. . . . We MUST use another test. This test can be a GREAT time-saver. Always perform it **FIRST**, not second, but FIRST!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!

Example 9:

Determine whether the following series converge or diverge. If they converge, find their sum.

(a) $\sum_{n=1}^{\infty} \frac{2n+3}{3n-5} = \frac{2}{3} \neq 0$

DIVERGES

(b) $\sum_{n=1}^{\infty} \frac{n!}{2n!+1} = \frac{1}{2} \neq 0$

DIVERGES

(c) $\sum_{n=1}^{\infty} \frac{3^n - 2}{3^n} = 1 \neq 0$

DIVERGES

(d) $\sum_{n=2}^{\infty} \frac{1}{(1.1)^n}$