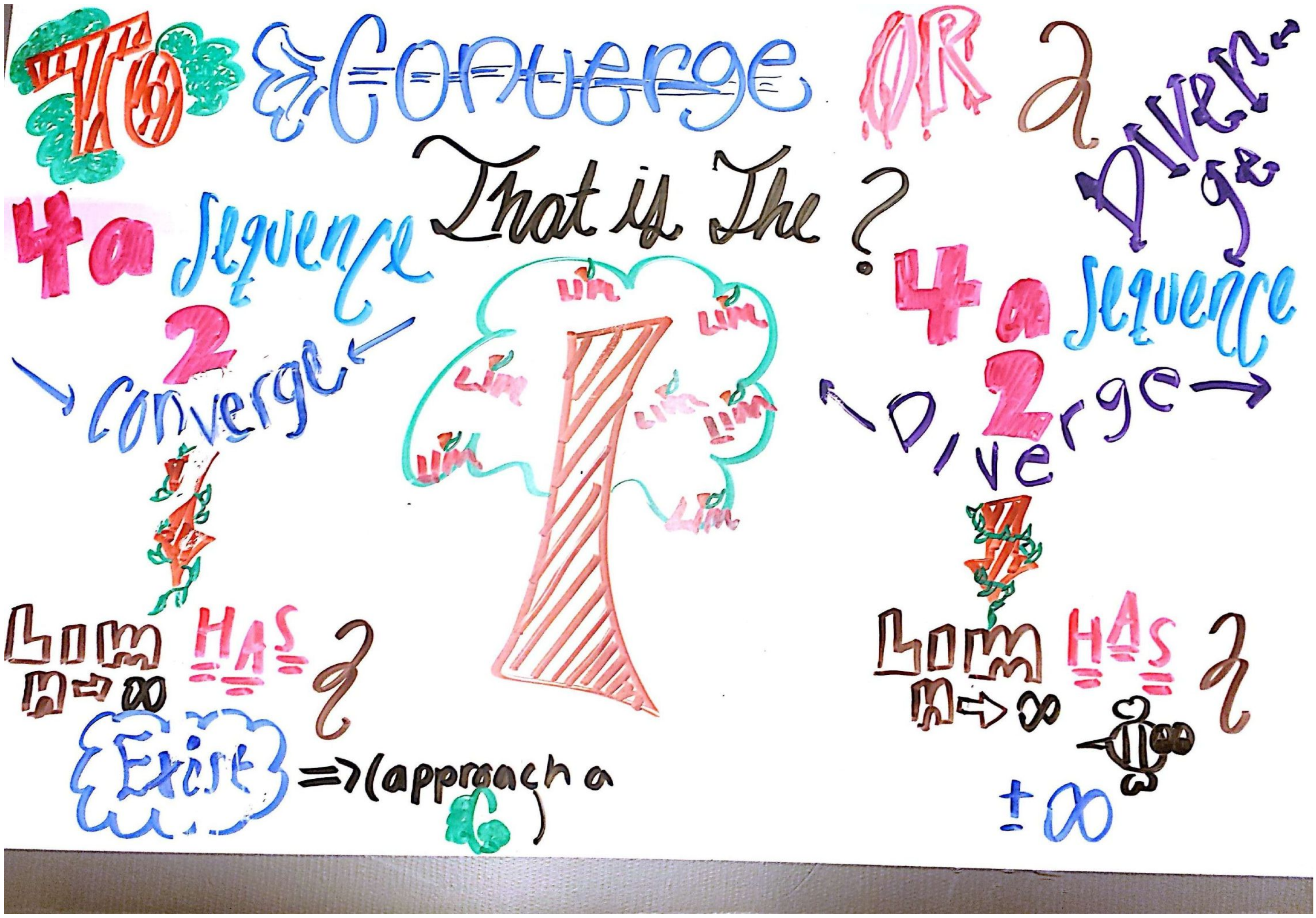
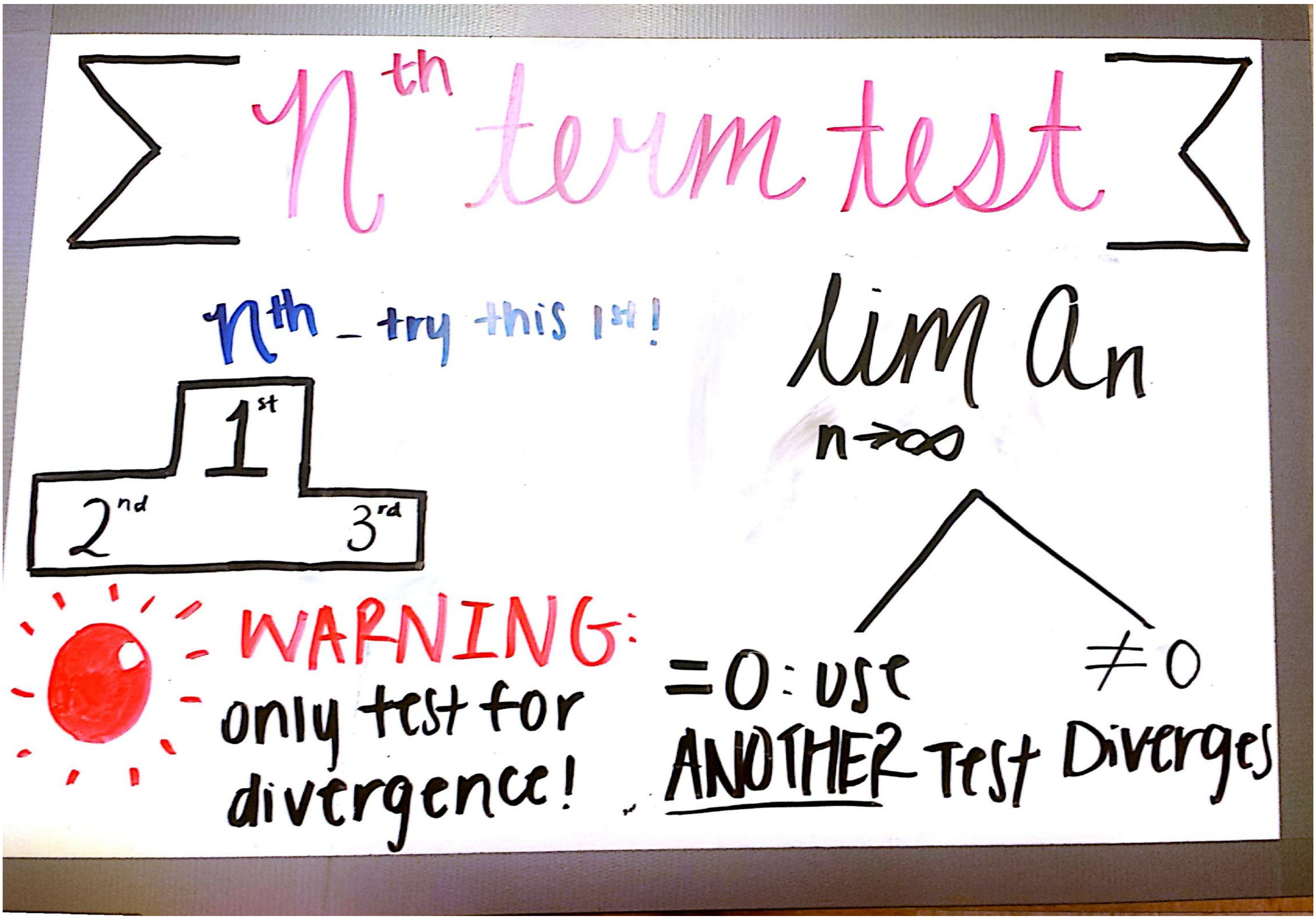


To Converge OR a Diverge
That is The ?
4 a Sequence 2 Converge
Lim n⇒∞ HAS a
Exist ⇒ (approach a C)
4 a Sequence 2 Diverge
Lim n⇒∞ HAS a
±∞
Lim


nth term test
nth - try this 1st!
1st
2nd
3rd
WARNING:
only test for divergence!
lim an
n→∞
=0: use ANOTHER Test
≠0
Diverges

P-series test

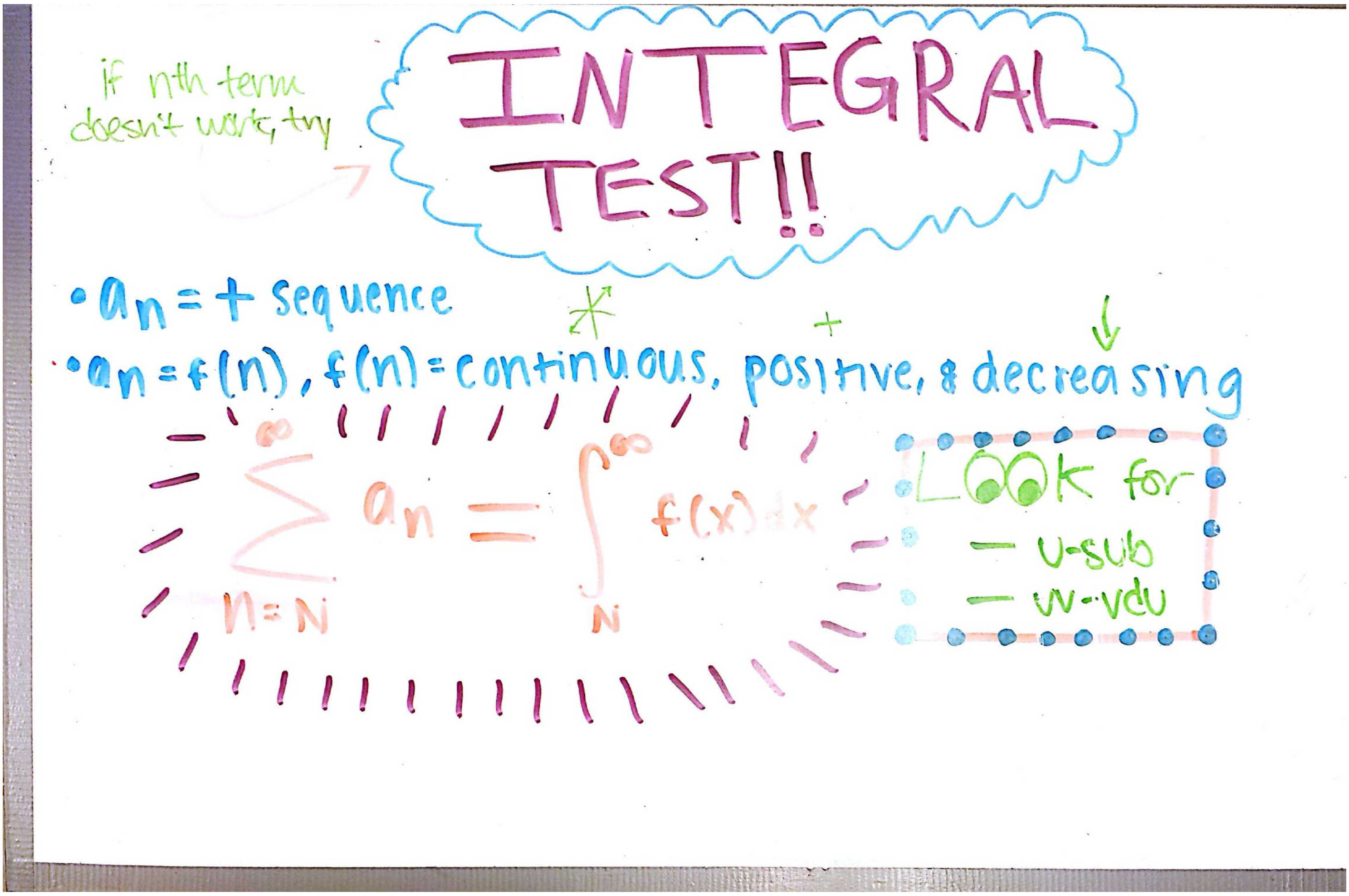
$$\sum_{n=1}^{\infty} \frac{1}{n^p}$$

$P = \frac{2}{3} \leq 1$ ∴ Diverge

$P = 4 > 1$ ∴ Converge

$P > 1$ converges

$P \leq 1$ diverges


if nth term doesn't work, try
INTEGRAL TEST!!
• a_n = + sequence
• $a_n = f(n)$, $f(n)$ = continuous, positive, & decreasing
$\sum_{n=N}^{\infty} a_n = \int_N^{\infty} f(x)\,dx$
LOOK for
— u-sub
— uv - vdu

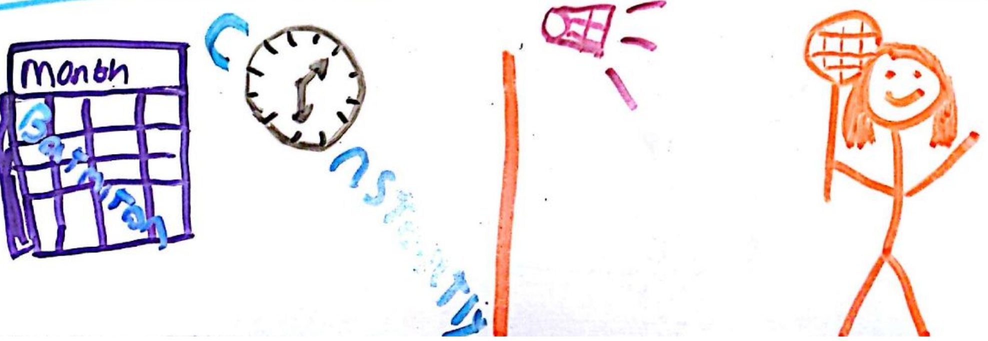
Direct Comparison Test: $a_n < b_n$

If: $\sum_{n=1}^{\infty} b_n$ (Big) Converges then: $\sum_{n=1}^{\infty} a_n$ (Small) Converges

must converge

If: $\sum_{n=1}^{\infty} a_n$ (small) Diverges then: $\sum_{n=1}^{\infty} b_n$ (Big) Diverges

can't converge on a single value



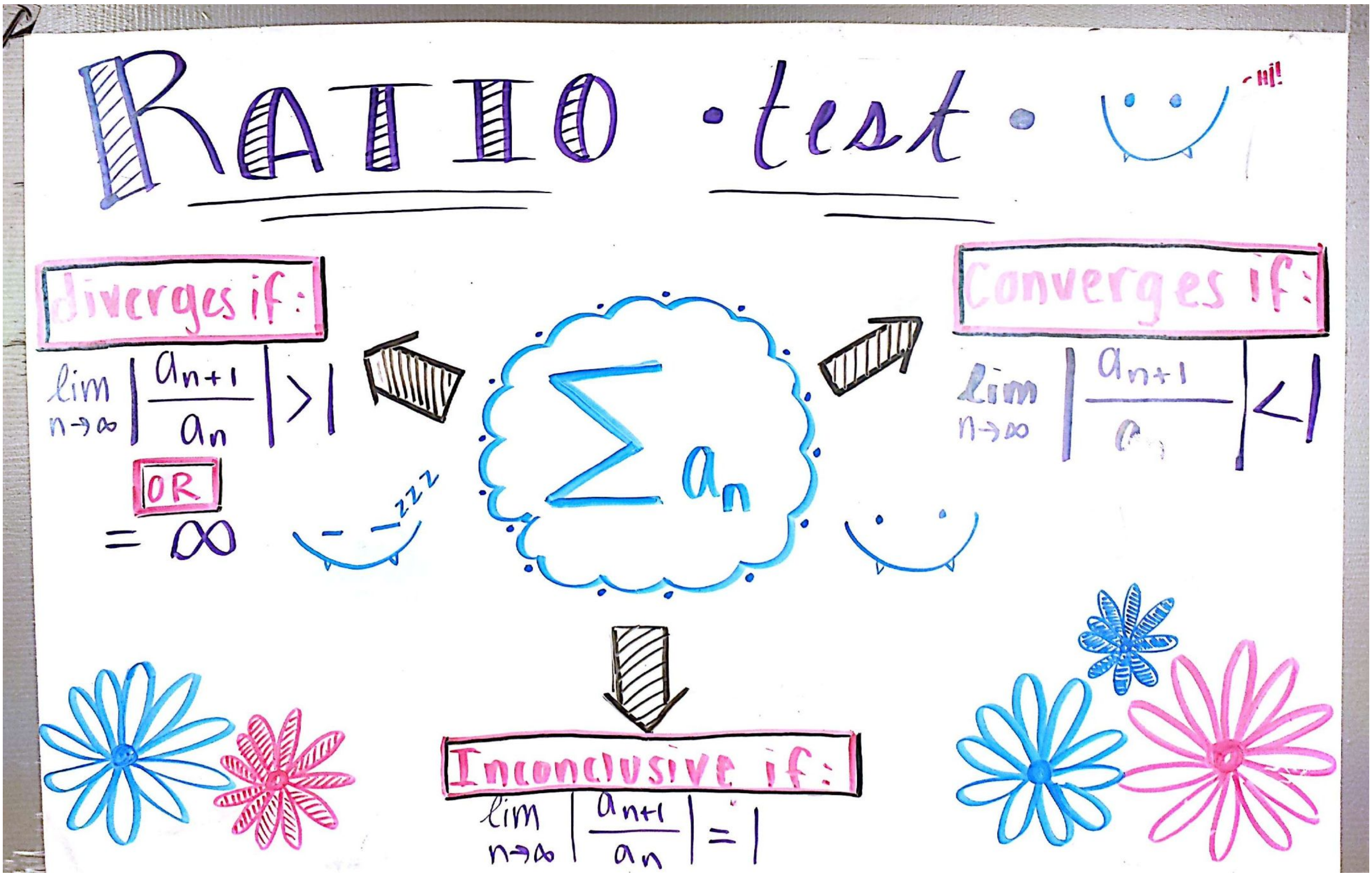
Sammit Does

Limit Comparison Test

a_n & b_n have to be ≥ 0

b_n = comparison to a_n

- $\lim_{n\to\infty} \frac{a_n}{b_n} = c$ where $0 < c < \infty$
  ↳ $\sum a_n$ & $\sum b_n$ converge or diverge
- $\lim_{n\to\infty} \frac{a_n}{b_n} = 0 \rightarrow \sum b_n$ converges, $\sum a_n$ converges
- $\lim_{n\to\infty} \frac{a_n}{b_n} = \infty \rightarrow \sum b_n$ diverges, $\sum a_n$ diverges


RATIO · test ·
HI!
diverges if:
$\lim_{n\to\infty} \left| \frac{a_{n+1}}{a_n} \right| > 1$
OR
$= \infty$
zzz
$\sum a_n$
Converges if:
$\lim_{n\to\infty} \left| \frac{a_{n+1}}{a_n} \right| < 1$
Inconclusive if:
$\lim_{n\to\infty} \left| \frac{a_{n+1}}{a_n} \right| = 1$

ROOT-T

$\sum_{n=1}^{\infty} a_n$ converges if

$$\lim_{n\to\infty} \sqrt[n]{|a_n|} < 1$$

$\sum_{n=1}^{\infty} a_n$ diverges if

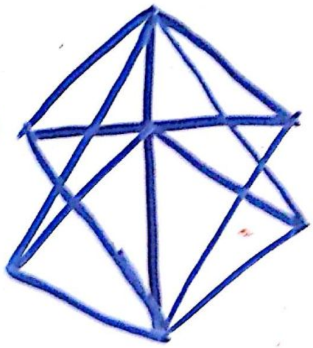
$$\lim_{n\to\infty} \sqrt[n]{|a_n|} > 1 \text{ or } \infty$$

$\sum_{n=1}^{\infty} a_n$ inconclusive if

$$\lim_{n\to\infty} \sqrt[n]{|a_n|} = 1$$

Po, Sam, Srikar

Geometric



Series

a = first term

r = growth factor

$$\sum_{n=0}^{\infty} a \cdot r^{n}$$

or

$$\sum_{n=1}^{\infty} a \cdot r^{n-1}$$

...if $|r| > 1$ DIVERGES

$|r| < 1$ CONVERGES

$$\text{sum} = \frac{a}{1-r}$$

ALTERNATING

Series test

$\sum$ math = ü

Converges if

$\lim_{n\to\infty} a_n = 0$ & terms are decreasing ($a_{n+1} \le a_n$)

Conditionally convergent

$\sum a_n$ converges **BUT** $\sum |a_n|$ diverges

AST (ALTERNATING SERIES TEST)

Let $a_n > 0$...

$$\sum_{n=1}^{\infty} (-1)^n \cdot a_n$$

AND...

$$\sum_{n=1}^{\infty} (-1)^{n+1} \cdot a_n$$

converges if...

1. $\lim_{n \to \infty} a_n = 0$
2. $a_{n+1} \leq a_n$ for all n

ABSOLUTE VS CONDITIONAL

- $\sum a_n$ is ABSOLUTELY CONVERGENT if $\sum |a_n|$ CONVERGES
- $\sum a_n$ is conditionally convergent IF $\sum a_n$ CONVERGES BUT $\sum |a_n|$ DIVERGES!