if you are asked
"what does it converge to?"

must be
- geometric, or
- telescoping

Telescoping Series

-consists of some repeating terms.
If you can figure out the pattern you can logically deduce the sum of the series.

Ex. 1

$$\sum_{n=1}^{\infty} \frac{1}{n+1} - \frac{1}{n+2}$$

$n=1$ $\quad$ $n=2$ $\quad$ $n=3$ $\quad$ $n=4$

$$\frac{1}{1+1} - \frac{1}{1+2} + \frac{1}{2+1} - \frac{1}{2+2} + \frac{1}{3+1} - \frac{1}{3+2} + \frac{1}{4+1} - \frac{1}{4+2}$$

$$\frac{1}{2} - \cancel{\frac{1}{3}} + \cancel{\frac{1}{3}} - \cancel{\frac{1}{4}} + \cancel{\frac{1}{4}} - \cancel{\frac{1}{5}} + \cancel{\frac{1}{5}} - \cancel{\frac{1}{6}} + \cancel{\ldots}$$

$1/2$

Ex. 2

$$\sum_{n=1}^{\infty} \frac{1}{n^2+n} = \frac{A}{n} + \frac{B}{n+1}$$

$n(n+1)$

$1 = A(n+1) + Bn$

$n = 0$

$1 = A$

$n = -1$

$1 = -B$

$-1 = B$

$$\sum_{n=1}^{\infty} \frac{1}{n} - \frac{1}{n+1}$$

$n=1$ $\quad$ $n=2$ $\quad$ $n=3$ $\quad$ $n=4$

$$\frac{1}{1} - \frac{1}{1+1} + \frac{1}{2} - \frac{1}{2+1} + \frac{1}{3} - \frac{1}{3+1} + \frac{1}{4} - \frac{1}{4+1}$$

$$1 - \cancel{\frac{1}{2}} + \cancel{\frac{1}{2}} - \cancel{\frac{1}{3}} + \cancel{\frac{1}{3}} - \cancel{\frac{1}{4}} + \cancel{\frac{1}{4}} - \cancel{\frac{1}{5}}$$

1

Ex. 3

do we need another...a little more to it

$$\sum_{n=1}^{\infty} \frac{4}{n(n+4)} = \frac{A}{n} + \frac{B}{n+4}$$

$4 = A(n+4) + Bn$

$n=-4$

$4 = B(-4)$

$-1 = B$

$n=0$

$4 = 4A$

$1 = A$

$$\sum_{n=1}^{\infty} \frac{1}{n} - \frac{1}{n+4}$$

$n=1$, $n=2$, $n=3$, $n=4$, $n=5$, $n=6$

$1 - \cancel{\frac{1}{5}} + \frac{1}{2} - \cancel{\frac{1}{6}} + \frac{1}{3} - \frac{1}{7} + \frac{1}{4} - \frac{1}{8} + \cancel{\frac{1}{5}} - \frac{1}{9} + \cancel{\frac{1}{6}} - \frac{1}{10}$

$1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4}$

$\frac{12}{12} + \frac{6}{12} + \frac{4}{12} + \frac{3}{12}$

$\frac{25}{12}$