BC #37 p. 511

$$\sum_{n=1}^{\infty} \frac{(n+3)!}{3!\,n!\,3^n}$$

Ratio Test: $\lim_{n\to\infty} \left| \frac{(n+4)!}{3!(n+1)!3^{n+1}} \cdot \frac{3!\,n!\,3^n}{(n+3)!} \right|$

$(n+4)! = (n+4)\cdot(n+3)!$

$$= \lim_{n\to\infty} \left| \frac{(n+4)!}{(n+3)!} \cdot \frac{3!}{3!} \cdot \frac{n!}{(n+1)!} \cdot \frac{3^n}{3^{n+1}} \right|$$

$$= \lim_{n\to\infty} \left| \frac{(n+4)\cdot 1 \cdot 1 \cdot 1}{1 \qquad (n+1) \quad 3} \right|$$

$$= \lim_{n\to\infty} \left| \frac{(n+4)}{(n+1)} \cdot \frac{1}{3} \right|$$

$$= 1 \cdot \frac{1}{3} <$$

Converges by Ratio Test

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AB/BC $\quad \frac{dB}{dt} = \frac{1}{5}(100 - B)$

$\frac{d^2B}{dt^2}$ 2nd derivative like: $\frac{dy}{dx} = \frac{1}{5}(100 - y)$

(a) plug in

(b) implicit diff.

(c) solve DEQ

$$\frac{dB}{100 - B} = \frac{1}{5}\,dt$$

Topic 2 Tests for convergence of series of numbers.

1. Integral Test

$\sum_{N}^{\infty} a_n$ where $a_n = f(n)$

series converges/diverges with $\int_{x=N}^{\infty} f(x)\,dx$

2. p-series test

p-series: $\sum_{n=1}^{\infty} \frac{1}{n^p}$ p is a constant

if $p=1$, $\sum \frac{1}{n}$ harmonic

$p>1$, converges

$p<1$, diverges

3. alternating series test

If 3 criteria met:

① strictly alternating $(+ - + - + - \cdots)$

② $\lim_{n\to\infty} a_n = 0$

③ $a_{n+1} \leq a_n$ for all $n$

then series converges

(might converge if one or more of the 3 not met)

"remainder" bound

series − partial sum with $n$ as last term

Then Remainder is less than $n+1^{\text{th}}$ term.

flow chart on p. 521 for order of applying the tests.