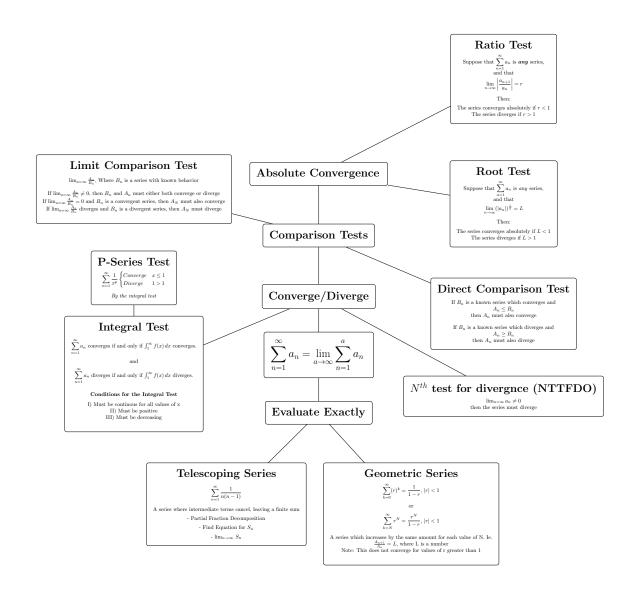
## Calc II Notes Pierson L



## 1 Ratio Test

The Ratio  $\operatorname{Test}^1$  states that

Suppose that 
$$\sum_{n=1}^{\infty} a_n$$
 is  $any$  series, and that 
$$\lim_{n\to\infty} \left| \frac{a_{n+1}}{a_n} \right| = r$$

Then:

The series converges absolutely if r < 1The series diverges if r > 1

## 1.1 Examples

ex. 1

Simplify 
$$\frac{(n+2)!}{(n-1)!}$$

Ratio of factorials

$$= \frac{(n+2)!}{(n-1)!}$$

$$= \frac{(n+1)(n+1)(n)(n-1)\cdots(1)}{(n-1)(n-2)(n-3)\cdots(1)}$$

$$= \frac{(n+1)(n+1)(n)(n-1)}{(n-1)}$$

$$= (n+1)(n+1)(n)$$

 $<sup>^{1}\</sup>mathrm{Very}$  important regarding factorials

## 1.2 Factorials

ex.1

$$4! = 4 \times 3! = 4x3x2! = 4x3x2x1! = 4x3x2x1x0!$$

$$0! = 1$$

$$4! = 24$$

ex. 2

Simplify 
$$\frac{(n+2)!}{(n-1)!}$$

 $Ratio\ of\ factorials$ 

$$= \frac{(n+2)!}{(n-1)!}$$

$$= \frac{(n+1)(n+1)(n)(n-1)\cdots(1)}{(n-1)(n-2)(n-3)\cdots(1)}$$

$$= \frac{(n+1)(n+1)(n)(n-1)}{(n-1)}$$

$$= (n+1)(n+1)(n)$$