
• Tyler Gillette - Geometric Series, Rational Function a_n, Telescoping
• Tyler Gillette - Rational Function a_n
• Henry Delgado - Did not Participate
• Giovani Santillan - Alternating Series
• Orion Salas - Factorials
• Ivan Stroh - Did Not Participate
1) Absolute Convergence
2) Conditional Convergence
3) Divergence
Features of Σ a_n
Example
Strategy
Process
Geometric
$a + ar + ar^2 + ar^3 + ...$
Convert the series given to a summation. Check that its a geometric series. Then check that -1 < r < 1
Check the Ratio, if the ratio is the same for the series its geometric
Rational Function a_n
$f(x) = (4x+4)/(x-2)$
Try and get the function simplified so that the leading powers on top and bottom can be used for a p-series or comparison test
Check that the denominators power is greater than 1 or the b_n converges
Alternating
$\Sigma(\infty, n = 1)(-1)^n a_n$
Suppose that for a_n , there exists an N so that for all n is greater than or equal to N , 1. a_n is positive and monotone decreasing, 2. the limit as n approaches infinity of a_n is 0
Check if the series is decreasing, positive, and the limit is equal to 0 to determine the convergence
Factorials
$n! = n*(n-1)*(n-2)*...*1$
Use the Ratio Test after changing "an" into "a(n+1)/an"
After plugging in (n+1) for all "n", the series is to set to a limit that goes to infinity, in which it's result will be determined for convergence by the ratio test
Telescoping
$lim_(n \to \infty) sqrt^n(|a_n|)$
$lim_(n \to \infty) a_n - a_(n+1)$
use partial fractions to rewrite and simplify, then use a test below
Simplify so that we can use a test below
By writing out some of the partial sums, we see that the partial sum is Sn = a1 - a(n+1)
Convergence is determined by the partial sum when writing the limit but typically the first value is the value the series converges
Is it a Geometric Series?
Constant ratio
$\sum_{n=1}^{\infty} a_1 (r)^{n-1}$
Yes
No
Series = 1, -3, 9, -27, 81, ... the common ratio r = -3 1*-3 = -3 -3*-3 = 9 9*-3 = -27
Series = 1, 3, 15, 2, 8, ... there is no common ratio
-1 < r < 1
Yes
No
n=# Σ ∞ a(r)^(n-1) = Converges and n=# Σ ∞ |a(r)^(n-1)| = Converges
Absolute Convergence
Diverges
Not a Geometric Series Failed, Try another method
Can we get the numerator to a 1?
Yes
No
P-Series
Comparison Test
1/x^p is p > 1
Yes
No
Absolute Convergence
Diverges
ia_n < b_n?
No
Failed, Try another method
Does b_n Converge?
Yes
No
Absolute Convergence
Diverges
Plug in any value from n =1 to infinity for n for the given series of a_n
Continue to plug in at least three more values.
First check if the values of the series are positive, if they are negative then it will diverge.
Second, if the values of the series were positive, then now check if the values of the series are decreasing after pluggin in values for n, if it is increasing it diverges
Now if a_n is positive and decreasing we have to make sure the limit of a_n is equal to 0 to determine the convergence of a_n.
We can find the limit of a_n by applying L'Hopitals rule
If the series a_n is positive, decreasing, and the limit is equal to 0, then the series (-1)^n a_n and (-1)^n-1 a_n will converge
If at least one of the 3 rules is not met then the series (-1)^n a_n and (-1)^n-1 a_n will diverge
Plug in (n+1) for all values of n. Gives you "a(n+1)"
Text
Now divide "a(n+1)" by "an" which equals--> "a(n+1)/an"
Simplfiy and cancel out like terms.
Set "a(n+1)/an", as a limit and solve for n-->∞
Is the Limit < 1?
Yes
No
Both and Neither
If the Limit is < 1, then according to the Ratio Test, the series absolutely converges
If Limit=1, then it is inconclusive whether the series converges or not
If the Limit is >1, then according to the Ratio Test, the series is divergent
Is the series overal raised to power?
No
Yes
Ratio Test
Root Test
$\lim_{n \to \infty} \frac{|a_{n+1}|}{|a_n|} = L$
$\lim_{n \to \infty} \sqrt[n]{|a_n|} = L$
- if L < 1, Σ a_n Converges Absolutely.
- if L > 1, or the limit goes to ∞, then Σ a_n Diverges.
- if L = 1, or L doesnt Exist then the test is inconclusive.
- if L < 1, Σ a_n Converges Absolutely.
- if L > 1, or the limit goes to ∞, then Σ a_n Diverges.
- if L = 1, or L doesnt Exist then the test is inconclusive.
If L< 1
Yes
No
L = 1
n=# Σ ∞ a(r)^(n-1) = Converges and n=# Σ ∞ |a(r)^(n-1)| = Converges
Absolute Convergence
Failed, Try another method
n=# Σ ∞ a(r)^(n-1) = Diverges and n=# Σ ∞ |a(r)^(n-1)| = Diverges
Divergence
Can we get the numerator to a 1?
Yes
No
P-Series
Comparison Test
1/x^p is p > 1
Yes
No
Absolute Convergence
Diverges
a_n < b_n?
Yes
No
Does b_n Converge?
Yes
No
Absolute Convergence
Diverges
Failed, Try another method