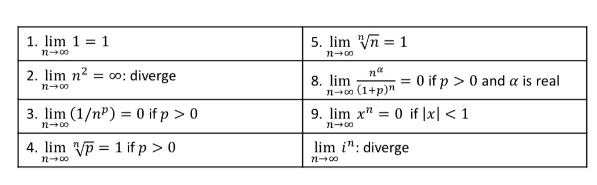
#part2

**Tell what are the comparison test, root test and ratio test of series, and answer the convergence of the series bellow based on the table.**



Comparison test is a way of deducing the convergence or divergence of an infinite series or an improper integral.

And root test is a criterion for the convergence (a convergence **test**) of an infinite series. It depends on the quantity. where. are the terms of the series, and states that the series converges absolutely if this quantity is less than one, but diverges if it is greater than one.

The ratio test is a test to determine the convergence of a series. It shows if the series is convergent, divergent or is neither convergent nor divergent.

**a)∑(-1)n**

= -1 + ½ - 1/3 + 1/4 -… = -(1-1/2)-(1/3-1/4)-…=

=-∑1/(2n\*(2n-1))

lim 1/(2n\*(2n-1)) = lim 1/(n2) = 0.

Result:converge

**b) ∑**

The ratio test says that the for the series ∑an, we can make a determination about its convergence by taking L=lima→∞∣∣∣an+1an∣∣∣. Examine the value of L:

If L>1, then ∑an is divergent.

If L=1, then the test is inconclusive.

If L<1, then ∑an is (absolutely) convergent.

So for the series ∞∑n=01n! we let an=1n!. Then we see that

L=limn→∞∣∣

∣∣1(n+1)!1n!∣∣

∣∣=limn→∞∣∣∣n!(n+1)!∣∣∣

This takes recalling a little bit about factorial. The definition of factorial states that (n+1)!=(n+1)(n!), similar to how 7!=7⋅6!. Thus:

L=limn→∞∣∣∣n!(n+1)(n!)∣∣∣=limn→∞∣∣∣1n+1∣∣∣=0

Since L=0 and therefore L<1, we see that ∑an=∞∑n=01n! is convergent through the ratio test.

**c) ∑n!**

= ∑n!(n+1) = ∑n!(n+1)(n+2) = ∑n!\*n2

n> 1=>n! > 1

and lim n2 : divergent

so lim n! = lim n!\*n2 : diverge

**d)∑an where an =1 / 2(n+1)/2 if n is odd, and an = 1/2n/2 if n is even.**

= 1/2+1/2+1/4+1/4+… =

= ∑1/n

lim 1/n = 0

result: converge

**e) ∑an where a1 =1 / 2if n is even, and an = 1/8\*an-1 if n is odd.**

= 1/8 + ½ + 1/8 \* 1/8 + ½ +…

= ∑n/2+ ∑1/8n

lim ∑n/2 = ∞

lim ∑1/8n = 0

result: diverge

**f) ∑(sqrt(n+1) – sqrt(n))**

= (sqrt(2) – sqrt(1))+ (sqrt(3) – sqrt(2)) +(sqrt(4) – sqrt(3))+…+ (sqrt(k+1) – sqrt(k))

=-sqrt(1) + (sqrt(2) – sqrt(2)) + (sqrt(3) – sqrt(3)) + (sqrt(4) - ….. – sqrt(k)) + sqrt(k+1)

= sqrt(k+1) - 1

As k goes to infinity, this diverges, so the infinite sum does not converge.

**g) ∑((sqrt(n+1) – sqrt(n))/n)**

an = ((sqrt(n+1) – sqrt(n))/n) \* (sqrt(n+1)+sqrt(n))/ (sqrt(n+1)+sqrt(n))

=1/(n \* ( sqrt(n+1)+sqrt(n)))

< 1 / (2 \* n \*sqrt(n)) = 1/(2 \* n3/2)

We know that the series:

∑1/(2 \* n3/2)

is convergent based on the p-series test, so the series is also convergent.

**h) ∑(nsqrt(n) - 1)n**

nsqrt(n) < 2 => k = nsqrt(n) – 1 < 1

so lim kn = 0

result: converge