

Home Work

① calculate

(i) $\int_0^{\infty} \frac{dx}{x^2+1}$ (ii) $\int_0^1 \frac{dx}{\sqrt{x}}$

(iii) $\int_0^4 \frac{dx}{\sqrt{4-x}}$ (iv) $\int_0^{\infty} e^{-x} \cos x dx$.

② Find an explicit algebraic expression for the sum of the first n terms of the following series.

(i) $\ln \frac{1}{2} + \ln \frac{2}{3} + \ln \frac{3}{4} + \dots + \ln \frac{n}{n+1} + \dots$

(ii) $2 + \frac{2}{3} + \frac{2}{9} + \frac{2}{27} + \dots + \frac{2}{3^{n-1}} + \dots$

③ Consider the series

$$1 + x + x^2 + x^3 + \dots$$

for what values of x does the series converge?

④ Consider the series

$$-\frac{1}{x} - \frac{1}{x^2} - \frac{1}{x^3} - \dots$$

for what values of x does this series converge?

Home work

(5) Determine if the given series converge, and in each case, give a reason for your answer!

$$(i) \sum_{n=1}^{\infty} \frac{n}{n^2+1}$$

$$(ii) \sum_{n=3}^{\infty} \frac{1}{n \ln n}$$

$$(iii) \sum_{n=1}^{\infty} \frac{n!}{n^n}$$

$$(iv) \sum_{n=1}^{\infty} \frac{(n+1)(n+2)}{n!}$$