Watch. Practice. Understand. | Lesson 345

Calculus BC Convergent and Divergent Series Test

Watch the matching video: https://www.youtube.com/watch?v=ywn2Y9X3mjk

Practice focus: Integral test and p-series

Related course review; confirm topics with your teacher.

Name: ____________________ Date: __________ Show your reasoning and check units.

01 Determine convergence of sum from n=1 to infinity of $1/n^2$.

02 Determine convergence of sum from n=1 to infinity of $1/\sqrt{n}$.

03 Use the integral test on sum from n=2 to infinity of $1/(n \ln n)$.

04 Bound the tail after N terms of sum $1/n^2$ using integrals.

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Practice focus: Comparison tests

Related course review; confirm topics with your teacher.

Name: ____________________ Date: __________ Show your reasoning and check units.

05 Determine convergence of sum $1/(n^2+1)$, $n>=1$.

06 Determine convergence of sum $1/\sqrt{(n^2+1)}$, $n>=1$.

07 Determine convergence of sum $n/(n^3+2)$, $n>=1$.

08 Why does being smaller than a divergent positive series not prove convergence?

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Practice focus: Alternating series and absolute convergence

Related course review; confirm topics with your teacher.

Name: ____________________ Date: __________ Show your reasoning and check units.

09 Determine absolute/conditional convergence of sum $(-1)^{(n+1)}/n$, $n>=1$.

10 Classify sum $(-1)^n/n^2$, $n>=1$.

11 How many terms guarantee error at most0.01 for the alternating harmonic series?

12 Why does sum $(-1)^n n$ fail the alternating series test and diverge?

Worked answers | Lesson 345

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01 Determine convergence of sum from n=1 to infinity of $1/n^2$.

p-series with p=2>1: convergent.

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02 Determine convergence of sum from n=1 to infinity of $1/\sqrt{n}$.

p=1/2<=1: divergent.

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03 Use the integral test on sum from n=2 to infinity of 1/(n ln n).

f is positive, continuous and decreasing on [2,infinity). Its integral ln(ln x) diverges, so the series diverges.

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04 Bound the tail after N terms of sum $1/n^2$ using integrals.

Integral_(N+1)^infinity x^-2 dx <= R_N <= integral_N^infinity x^-2 dx. Thus 1/(N+1)<=R_N<=1/N.

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05 Determine convergence of sum $1/(n^2+1)$, $n>=1$.

$0<1/(n^2+1)<=1/n^2$. The comparison p-series converges, so this series converges.

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06 Determine convergence of sum $1/\sqrt{(n^2+1)}$, $n>=1$.

Limit comparison with $1/n$: $n/\sqrt{(n^2+1)}\to 1$. Since harmonic series diverges, so does this series.

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07 Determine convergence of sum $n/(n^3+2)$, $n>=1$.

Limit comparison with $1/n^2$ gives $n^3/(n^3+2)\to 1$. It converges.

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08 Why does being smaller than a divergent positive series not prove convergence?

A smaller series may converge or diverge. Comparison conclusions require the correct direction and a suitable known benchmark.

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Practice focus: Alternating series and absolute convergence

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09 Determine absolute/conditional convergence of sum $(-1)^{(n+1)}/n$, $n>=1$.

Alternating terms decrease to0, so it converges. Absolute series is harmonic and diverges: conditional convergence.

10 Classify sum $(-1)^n/n^2$, $n>=1$.

Absolute series sum$1/n^2$ converges; therefore absolutely convergent.

11 How many terms guarantee error at most0.01 for the alternating harmonic series?

Error $<=1/(N+1)$. Require $1/(N+1)<=0.01$, giving $N>=99$ terms.

12 Why does sum $(-1)^n n$ fail the alternating series test and diverge?

Term magnitudes grow, and signed terms do not approach0. The term test already proves divergence.