

Watch. Practice. Understand. | Lesson 337

2022 The Secret of Telescoping Series and Geometric Series (Rokawski Calculus 10.2 Pa...

Watch the matching video: <https://www.youtube.com/watch?v=xtUNIAQHBJE>

Practice focus: Infinite series and telescoping

Original extra practice matched to the listed lesson topic.

Name: _____ Date: _____ Show your reasoning and check units.

01 Find the sum from $n=1$ to infinity of $1/(n(n+1))$.

02 Does the harmonic series sum $1/n$ converge?

03 Evaluate the sum from $n=0$ to infinity of $3(1/4)^n$.

04 Explain why $a_n \rightarrow 0$ is necessary but not sufficient for $\sum a_n$ to converge.

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Practice focus: Geometric sequences and series

Original extra practice matched to the listed lesson topic.

Name: _____ Date: _____ Show your reasoning and check units.

05 Find term 6 of 3, 6, 12,

06 Find the first 6-term sum of 3, 6, 12,

07 Find the infinite sum $12 + 6 + 3 + \dots$.

08 Does $1 - 2 + 4 - 8 + \dots$ converge?

Worked answers | Lesson 337

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01 Find the sum from $n=1$ to infinity of $1/(n(n+1))$.

$1/(n(n+1))=1/n-1/(n+1)$. Partial sum $1-1/(N+1)$ tends to 1.

02 Does the harmonic series $\sum 1/n$ converge?

No; it diverges, for example by the integral test with $\int_1^{\infty} dx/x$.

03 Evaluate the sum from $n=0$ to infinity of $3(1/4)^n$.

Geometric ratio $1/4$; $\text{sum}=3/(1-1/4)=4$.

04 Explain why $a_n \rightarrow 0$ is necessary but not sufficient for $\sum a_n$ to converge.

Convergence implies terms tend to 0, but harmonic terms $1/n$ tend to 0 while their series diverges.

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Practice focus: Geometric sequences and series

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05 Find term 6 of 3, 6, 12,

$$a_n = 3(2)^{(n-1)}, \text{ so } a_6 = 96.$$

06 Find the first 6-term sum of 3, 6, 12,

$$S_6 = 3(2^6 - 1)/(2 - 1) = 189.$$

07 Find the infinite sum $12 + 6 + 3 + \dots$.

$$\text{Ratio } r = 1/2 \text{ has magnitude below } 1. \text{ Sum} = 12/(1 - 1/2) = 24.$$

08 Does $1 - 2 + 4 - 8 + \dots$ converge?

No. The terms do not approach zero; also the geometric ratio has magnitude $2 > 1$.