Name: Richard

Quiz 19

MATH 201
April 10, 2025

1. Use the comparison test or the limit comparison test to determine whether the series converges:

$$\sum_{k=2}^{\infty} \sqrt{\frac{k}{k^3-1}} > \sum_{k=2}^{\infty} \sqrt{\frac{k}{k^3}} = \sum_{k=2}^{\infty} \sqrt{\frac{1}{k^2}} = \underbrace{\sum_{k=2}^{\infty} \frac{1}{k}}_{\text{Harmonic Series. Diverges!}}$$

Denominator here is larger than one on left, so fraction is smaller.

Conclusion: $\sum_{k=2}^{\infty} \sqrt{\frac{k}{k^3-1}}$ diverges by comparison with the harmonic series

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QUIZ 19

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1. Use the comparison test or the limit comparison test to determine whether the series converges:

$$\sum_{k=2}^{\infty} \frac{k}{\sqrt{k^5+1}} < \sum_{k=2}^{\infty} \frac{k}{\sqrt{k^5}} = \sum_{k=2}^{\infty} \frac{k}{k^{5/2}} = \underbrace{\sum_{k=2}^{\infty} \frac{1}{k^{3/2}}}_{\text{Convergent } p\text{-series with } p = \frac{3}{2}}$$

Denominator $\sqrt{k^5}$ is smaller than denominator $\sqrt{k^5+1}$ on left, so fraction is larger!

Convergent p-series with $p = \frac{3}{2}$

<u>Conclusion</u> $\sum_{k=2}^{\infty} \frac{k}{\sqrt{k^5+1}}$ <u>converges</u>

by comparison with the convergent p-series

$$\sum_{k=2}^{\infty} \frac{1}{k^{3/2}}$$