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:

$$\sum_{k=2}^{\infty} \sqrt{\frac{k}{k^3-1}} > \sum_{k=2}^{\infty} \sqrt{\frac{k}{k^3}} = \sum_{k=2}^{\infty} \sqrt{\frac{1}{k^2}} = \underbrace{\sum_{k=2}^{\infty} \frac{1}{k}}$$

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

Harmonic Series. Diverges!

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

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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:

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

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

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

by comparison with the convergent p-series

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