Math 121, Sections 01, 02, 03, Fall 2021

Homework #12

Due **Friday, October 15th** in Gradescope by 11:59 pm ET

Goal: Exploring Convergence of Infinite Series. Focus on Integral Test, p-series, Comparison and Limit Comparison Test. We will also focus on fluency of training, using multiple tests.

Use the Integral Test to determine whether the given series Convergese or Diverges. You need to check the 3 pre-conditions each time.

1. $\sum_{n=1}^{\infty} \frac{1}{n}$ 2. $\sum_{n=1}^{\infty} \frac{1}{n^3}$ 3. $\sum_{n=2}^{\infty} \frac{1}{n \ln n}$ 4. $\sum_{n=1}^{\infty} \frac{n}{e^n}$

5. Consider $\sum_{n=1}^{\infty} \frac{1}{n^2+4}$. Use **two** Different methods, namely the Integral Test and the Comparison Test, to prove that this series Converges.

Determine whether the given series Converges or Diverges using a Comparison Test.

6. $\sum_{n=1}^{\infty} \frac{9^n}{3+10^n}$ 7. $\sum_{n=1}^{\infty} \frac{n^2+5}{n^3}$ 8. $\sum_{n=1}^{\infty} \frac{2}{\sqrt{n}+2}$ 9. $\sum_{n=1}^{\infty} \frac{n^2+7}{n^7+2}$

10. Consider $\sum_{n=1}^{\infty} \frac{5n^2+n}{n^4}$. Use **two** Different methods to prove that this series Converges. Use the Limit Comparison Test and then a *split-split* technique into p-series pieces.

Determine whether the given series Converges or Diverges. Justify.

11. $\sum_{n=1}^{\infty} \sin^2\left(\frac{\pi n^4+1}{6n^4+5}\right)$ 12. $\sum_{n=1}^{\infty} \frac{\sin^2(\pi n^4+1)}{6n^4+5}$ 13. $\sum_{n=1}^{\infty} \frac{7}{n^9} + \frac{7^n}{9^n}$

Review

14. $\sum_{n=1}^{\infty} n^6+6$ 15. $\sum_{n=1}^{\infty} \frac{n^6+6}{n^6+1}$ 16. $\sum_{n=1}^{\infty} \frac{1}{n^6+1}$

REGULAR OFFICE HOURS

Monday: 1:00–3:00 pm

9–10:30 pm TA Mia, SMUDD 207

Tuesday: 12:00–4:00 pm

6–7:30 pm TA Ian, SMUDD 207

7:30–9:00 pm TA Karime, SMUDD 207

Wednesday: 1:00-3:00 pm

6–7:30 pm TA Ian, SMUDD 207

7:30–9:00 pm TA Daksha, SMUDD 207

Thursday: none for Professor

1–2:30 pm TA Mia, SMUDD 207

7:30–9:00 pm TA Daksha, SMUDD 207

Friday: 12:00–2:00 pm

2:30–4:00 pm TA Karime, SMUDD 014**

Train your Convergence Tests Daily