Math 121, Section 01, Spring 2022

Homework #19

Due **Friday, April 29th** in Gradescope by 11:59 pm ET

Goal: Exploring More complicated Sums.

Find the **sum** of each of the following series (which do converge). Simplify.

1. $1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \frac{1}{9} - \dots$

2. $\sum_{n=0}^{\infty} \frac{(-1)^n \ \pi^{2n+1}}{9^n \ (2n)!}$

3. $-\frac{\pi^3}{3!} + \frac{\pi^5}{5!} - \frac{\pi^7}{7!} + \frac{\pi^9}{9!} - \dots$

4. $-\frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \frac{1}{9} - \dots$

5. $-1 + \frac{1}{2} - \frac{1}{3} + \frac{1}{4} - \frac{1}{5} + \frac{1}{6} - \dots$

6. $\sum_{n=0}^{\infty} \frac{(-1)^n \, (\ln 8)^n}{3^{n+1} \ n!}$

7. $\sum_{n=0}^{\infty} \frac{(-1)^n \ \pi^{2n}}{(36)^n \ (2n+1)!}$

8. $\frac{1}{6} - \frac{1}{2(6)^2} + \frac{1}{3(6)^3} - \frac{1}{4(6)^4} + \dots$

9. $1 - e + \frac{e^2}{2!} - \frac{e^3}{3!} + \frac{e^4}{4!} - \frac{e^5}{5!} + \dots$

10. $-\frac{\pi^2}{2!} + \frac{\pi^4}{4!} - \frac{\pi^6}{6!} + \frac{\pi^8}{8!} - \dots$

11. $\sum_{n=0}^{\infty} \frac{(-1)^n \ \pi^{2n}}{(2n)!}$

12. $\sum_{n=0}^{\infty} \frac{1}{e^n}$

13. $\sum_{n=0}^{\infty} \frac{(-1)^{n+1} \ 2^{n+1} \ (\ln 9)^n}{n!}$

14. $4 - \frac{4}{3} + \frac{4}{5} - \frac{4}{7} + \frac{4}{9} - \dots$

15. $\sum_{n=0}^{\infty} \frac{e^6 \ (x-6)^n}{n!}$ (answer will be in x)

16. $\sum_{n=0}^{\infty} \frac{(-1)^{n+1} \ \pi^{2n+1}}{9 \ (2n)!}$

17. $\sum_{n=0}^{\infty} \frac{1}{3! \ \pi^n}$

18. $-\pi + \frac{\pi^3}{3!} - \frac{\pi^5}{5!} + \dots$

19. $1 + 1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \dots$

20. $2 - 1 + \frac{2}{3} - \frac{2}{4} + \frac{2}{5} - \dots$

21. $\frac{1}{2!} - \frac{1}{3!} + \frac{1}{4!} - \frac{1}{5!} + \dots$

22. $\sum_{n=0}^{\infty} \frac{(-1)^n \pi^{2n+1}}{\left(\sqrt{2}\right)^{4n} (2n)!}$

23. Use Series to Compute $\lim_{x \to 0} \frac{xe^x - \arctan x}{\ln(1+5x) - 5x}$ Check your answer using L'Hôpital's Rule

REGULAR OFFICE HOURS

Sunday: 6–7:30 pm TA Nico, SMUDD 207

Monday: 1:00–3:00 pm

6–7:30 pm TA Daksha, SMUDD 207

7:30–9:00 pm TA Karime, SMUDD 207

Tuesday: 12:00–4:00 pm

6–7:30 pm TA Ian, SMUDD 207

7:30–9:00 pm TA Nico, SMUDD 207

Wednesday: 1:00-3:00 pm

9–10:30 pm TA Daksha, SMUDD 207

Thursday: none for Professor

6–7:30 pm TA Ian, SMUDD 207

7:30–9:00 pm TA Karime, SMUDD 207

Friday: 12:00–2:00 pm

Match the sum formulas precisely.

Pattern find and check your guess too.