Series

Problem 1. State the Limit Comparison Test.

Problem 2. Determine whether $\sum_{k=1}^{\infty} \frac{1}{k+1}$ converges or diverges.

Problem 3. Determine whether $\sum_{k=1}^{\infty} \frac{k+\sin k e^{-k}}{\sqrt{k^6-k^2}}$ converges or diverges.

Problem 4. Determine whether $\sum_{k=1}^{\infty} \frac{k-\cos k}{k^2 \ln(k)^2 - k}$ converges or diverges.

Problem 5. Determine whether $\sum_{k=1}^{\infty} \frac{k+1}{k^3-1}$ converges or diverges.

Problem 6. Determine whether $\sum_{k=1}^{\infty} \sin \frac{1}{k}$ converges or diverges.

Problem 7. What is an alternating series? What does the Alternating Series Test say? What is the remainder theorem for Alternating Series?

Problem 8. Determine whether $\sum_{k=1}^{\infty} \frac{(-1)^k}{k}$ converges or diverges. If it converges, how many terms need to be taken so that the Nth partial sum is within .1 of the sum?

Problem 9. Determine whether $\sum_{k=1}^{\infty} \frac{\cos \pi k}{\ln \ln k}$ converges or diverges. If it converges, how many terms need to be taken so that the Nth partial sum is within .1 of the sum?

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Problem 10. Determine whether $\sum_{k=1}^{\infty} \frac{k(-1)^k}{k+1}$ converges or diverges. If it converges, how many terms need to be taken so that the Nth partial sum is within .1 of the sum?

Problem 11. Determine whether $\sum_{k=1}^{\infty}(-1)^k \sin\frac{1}{k}$ converges or diverges. If it converges, how many terms need to be taken so that the Nth partial sum is within .1 of the sum?

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Problem 12. Determine whether $\sum_{k=1}^{\infty}(-1)^k(\sqrt{k^2+1}-\sqrt{k^2})$ converges or diverges. If it converges, how many terms need to be taken so that the Nth partial sum is within .1 of the sum?

Problem 13. Determine whether $\sum_{k=1}^{\infty}(-1)^k \frac{1}{k^2 \cos k}$ converges or diverges. If it converges, how many terms need to be taken so that the Nth partial sum is within .1 of the sum?

Problem 14. What does it mean for the series $\sum a_k$ to converge absolutley? Can a series converge absolutley but not converge? Can a series converge but not absolutley?

Problem 15. What does the Ratio Test say?

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Problem 16. Determine whether the series $\sum_{k=1}^{\infty} \frac{k}{5^k}$ converges or diverges.

Problem 17. Determine whether the series $\sum_{k=1}^{\infty}(-1)^k \frac{3^k k^3}{5^k}$ converges or diverges.

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Problem 18. Determine whether the series $\sum_{k=1}^{\infty}(-1)^k \frac{5^k}{3^k k^5}$ converges or diverges.

Problem 19. Determine whether the series $\sum_{k=1}^{\infty} \frac{(2k+1)! \cos k}{k^5 10^k}$ converges or diverges.

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Problem 20. Determine whether the series $\sum_{k=1}^{\infty} \frac{k5^{2k}}{(3k+1)!}$ converges or diverges.

Problem 21. If $a_k = 2$ and $a_{k+1} = \frac{5k-17\sin k}{4k+3}a_k$ determine whether $\sum a_k$ converges or diverges.

Problem 22. If $a_k = 2$ and $a_{k+1} = (k \sin \frac{1}{2k})a_k$ determine whether $\sum a_k$ converges or diverges.