

AP Calculus BC

Infinite Series

The Integral and p-test

Name _____

Use the Integral Test to determine the convergence or divergence of the series.

1. $\sum_{n=1}^{\infty} \frac{1}{n+1}$

2. $\sum_{n=1}^{\infty} \frac{1}{3n+5}$

3. $\sum_{n=1}^{\infty} e^{-n}$

4. $\sum_{n=1}^{\infty} ne^{-n/2}$

5. $\frac{1}{2} + \frac{1}{5} + \frac{1}{10} + \frac{1}{17} + \frac{1}{26} + \dots$

6. $\frac{1}{3} + \frac{1}{5} + \frac{1}{7} + \frac{1}{9} + \frac{1}{11} + \dots$

7. $\frac{\ln 2}{2} + \frac{\ln 3}{3} + \frac{\ln 4}{4} + \frac{\ln 5}{5} + \frac{\ln 6}{6} + \dots$

8. $\frac{\ln 2}{\sqrt{2}} + \frac{\ln 3}{\sqrt{3}} + \frac{\ln 4}{\sqrt{4}} + \frac{\ln 5}{\sqrt{5}} + \frac{\ln 6}{\sqrt{6}} + \dots$

9. $\frac{1}{\sqrt{1}(\sqrt{1}+1)} + \frac{1}{\sqrt{2}(\sqrt{2}+1)} + \frac{1}{\sqrt{3}(\sqrt{3}+1)} + \dots + \frac{1}{\sqrt{n}(\sqrt{n}+1)} + \dots$

10. $\frac{1}{4} + \frac{2}{7} + \frac{3}{12} + \dots + \frac{n}{n^2+3} + \dots$

11. $\sum_{n=1}^{\infty} \frac{1}{\sqrt{n+1}}$

12. $\sum_{n=2}^{\infty} \frac{\ln n}{n^3}$

13. $\sum_{n=2}^{\infty} \frac{1}{n\sqrt{\ln n}}$

14. $\sum_{n=1}^{\infty} \frac{\arctan n}{n^2+1}$

15. $\sum_{n=1}^{\infty} \frac{n}{n^4+1}$

Explain why the Integral Test does not apply to the series.

$$16. \sum_{n=1}^{\infty} \frac{(-1)^n}{n}$$

$$17. \sum_{n=1}^{\infty} e^{-n} \cos n$$

$$18. \sum_{n=1}^{\infty} \frac{2 + \sin n}{n}$$

$$19. \sum_{n=1}^{\infty} \left(\frac{\sin n}{n} \right)^2$$

Use the p-test to determine the convergence or divergence of the series.

$$20. \sum_{n=1}^{\infty} \frac{1}{\sqrt[3]{n}}$$

$$21. \sum_{n=1}^{\infty} \frac{1}{n^2}$$

$$22. \sum_{n=1}^{\infty} \frac{1}{n^{5/3}}$$

$$23. \sum_{n=1}^{\infty} \frac{1}{n^\pi}$$

$$24. 1 + \frac{1}{\sqrt{2}} + \frac{1}{\sqrt{3}} + \frac{1}{\sqrt{4}} + \dots$$

$$25. 1 + \frac{1}{4} + \frac{1}{9} + \frac{1}{25} + \dots$$

$$26. 1 + \frac{1}{2\sqrt{2}} + \frac{1}{3\sqrt{3}} + \frac{1}{4\sqrt{4}} + \frac{1}{5\sqrt{5}} + \dots$$

Find a positive value of P for which the series converges.

$$27. \sum_{n=2}^{\infty} \frac{1}{n(\ln n)^p}$$

$$28. \sum_{n=2}^{\infty} \frac{\ln n}{n^p}$$

$$29. \sum_{n=1}^{\infty} \frac{n}{(1+n^2)^p}$$

$$30. \sum_{n=1}^{\infty} n(1+n^2)^p$$