

Cálculo 2 - Lista 2

Séries: Teste da comparação

Use o teste da comparação para verificar a convergência ou não das séries. Nestes problemas lembre-se que

(i) $\sum_{n=1}^{\infty} \frac{1}{n}$ diverge

(ii) $\sum_{n=1}^{\infty} q^n$ converge se $|q| < 1$ e diverge se $|q| \geq 1$

(iii) $\sum_{n=1}^{\infty} \frac{1}{n^p}$ converge se $p > 1$ e diverge se $p \leq 1$

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

2. $\sum_{n=1}^{\infty} \frac{1}{n} \left(\frac{2}{5}\right)^n$

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

4. $\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n+\sqrt{10}}$

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

6. $\sum_{n=1}^{\infty} \frac{1}{10n+1}$

7. $\sum_{n=1}^{\infty} \frac{1}{\sqrt{n(n+1)}}$

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

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

10. $\sum_{n=1}^{\infty} \frac{1}{(3n-1)^2}$

11. $\sum_{n=1}^{\infty} \frac{\sqrt[3]{n}}{(n+1)\sqrt{n}}$

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

13. $\sum_{n=1}^{\infty} \frac{1}{\sqrt{n^3+1}}$

14. $\sum_{n=2}^{\infty} \frac{1}{\sqrt{n^2-1}}$

15. $\sum_{n=1}^{\infty} \frac{1}{\sqrt{n^2+1}}$

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

17. $\sum_{n=1}^{\infty} \frac{1}{e^{n^2}}$
[Sugestão: $\frac{1}{e^n} = \left(\frac{1}{e}\right)^n$]

18. $\sum_{n=1}^{\infty} \frac{1}{(n-1)(n-2)}$

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

20. $\sum_{n=1}^{\infty} \frac{n^2-1}{n^3-n-1}$

21. $\sum_{n=3}^{\infty} \frac{3+\cos n}{n^2-4}$

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

23. $\sum_{n=1}^{\infty} \frac{\sqrt{n}}{n^2-3}$

24. $\sum_{n=1}^{\infty} \frac{\cos^2 n}{n^{3/2}}$

25. $\sum_{n=1}^{\infty} \frac{n}{(n^3+1)^{3/7}}$

26. $\sum_{n=1}^{\infty} \frac{1}{\sqrt[3]{n^2+1}}$

27. $\sum_{n=2}^{\infty} \frac{1}{n\sqrt{n^2-1}}$

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

[Sugestão: $\ln n \leq \sqrt{n} \leq n \leq n^2 \leq n^n < e^n, n \geq 1$]

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

30. $\sum_{n=1}^{\infty} \frac{1}{(\ln n)^n}$

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

[Sugesta ao: $n^3 < e^n, n \geq 1$]

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

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

Respostas:

1. diverge
2. converge
3. diverge
4. diverge
5. diverge
6. diverge
7. diverge
8. diverge
9. diverge
10. converge
11. converge
12. converge
13. converge
14. diverge
15. diverge
16. diverge
17. converge
18. converge
19. converge
20. diverge
21. converge
22. converge
23. converge
24. converge
25. diverge
26. diverge
27. converge
28. converge
29. diverge

30. converge

31. converge

32. diverge

33. diverge