From the files of Norman Dobson
(edited by T. Gideon)
Calculus II – Final Exam Problems
Alternating Series

Determine whether the series converge absolutely, converge conditionally, or diverge. Justify.

1. $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^n}{\sqrt{n}}$
2. $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^n(2n+1)}{n^2}$
3. $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^n e^n}{n}$
4. $\displaystyle\sum_{n=1}^{\infty} (-1)^n \frac{\ln n}{n}$
5. $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^n}{\sqrt{n}+\sqrt{n+1}}$
6. $\displaystyle\sum_{n=3}^{\infty} \frac{(-1)^n}{\sqrt{n(n-1)}}$
7. $\displaystyle\sum_{n=1}^{\infty} (-1)^n \ln \sqrt[n]{n}$
8. $\displaystyle\sum_{n=2}^{\infty} \frac{(-1)^n}{n \ln n}$
9. $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^n(n^2+1)}{n^3}$
10. $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^n 5n^2}{(n+1)!}$
11. $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^n}{\ln(n+1)}$
12. $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^n}{(3n+2)(n+1)}$
13. $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^n}{n^{4/5}}$
14. $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^n n}{n+2}$
15. $\displaystyle\sum_{n=2}^{\infty} \frac{(-1)^n 3^{n+1}}{(n-2)!}$
16. $\displaystyle\frac{1}{\sqrt{2}} - \frac{1}{\sqrt{4}} + \frac{1}{\sqrt{6}} - \frac{1}{\sqrt{8}} + \cdots + \frac{(-1)^{n+1}}{\sqrt{2n}} + \cdots$
17. $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^{n+1} n^2}{n^3+1}$
18. $\displaystyle\sum_{n=0}^{\infty} \frac{(-1)^n (4n)!}{n!}$
19. $\displaystyle\sum_{n=1}^{\infty} (-1)^{n+1} \frac{n+1}{n\sqrt{n}}$
20. $\displaystyle\sum_{k=1}^{\infty} (-1)^k \left(\frac{k}{2}\right)^k$
21. $\displaystyle\sum_{k=1}^{\infty} (-1)^k \frac{k}{e^k}$
22. $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^n (n+1)}{5n^4 - 4n + 3}$
23. $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^n n^{3/2}}{n^2+3}$
24. $\displaystyle\sum_{n=2}^{\infty} \frac{(-1)^n}{n\sqrt{\ln n}}$
25. $\displaystyle\sum_{n=1}^{\infty} (-1)^n \frac{n+1}{n\sqrt{n}}$
26. $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^n}{n!}$
27. $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^n (3n+2)}{n^2+1}$
28. $\displaystyle\sum_{n=1}^{\infty} (-1)^{n+1} \left[\frac{3n+1}{n+4}\right]^n$

Answers:

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