Middlebury College

Calculus II: Spring 2018

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Problems on series

Determine whether the series converges or diverges. Justify your solution with an appropriate test of convergence, explaining carefully why you are allowed to apply that test. If possible, try to determine the limit. If possible, try to apply several different tests to obtain your solution. * problems are more challenging, ** problems are very challenging.

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

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

3. *
$$\sum_{n=1}^{\infty} \frac{3^n}{n!}$$

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

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

6.
$$\sum_{n=1}^{\infty} \frac{n^2 + 1}{n^2 - 2}$$

7.
$$\sum_{m=1}^{\infty} \frac{1 - \sin(4m)}{m^2}$$

8.
$$\sum_{n=1}^{\infty} \frac{2 \cdot 4 \cdot 6 \cdot \cdots \cdot (2n-2) \cdot 2n}{n!}$$

9.
$$\sum_{n=1}^{\infty} \frac{n}{n^2 + 1}$$

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

11.
$$\sum_{n=1}^{\infty} \frac{2^n + 4^n}{3^n + 5^n}$$

12.
$$\sum_{j=1}^{\infty} \frac{1}{2 + \sin j}$$

13.
$$\sum_{n=1}^{\infty} \frac{6 + \sin(2n)}{2 + 2^n}$$

14.
$$\sum_{k=1}^{\infty} \frac{1}{n + n!}$$

15.**
$$\sum_{k=1}^{\infty} \frac{n}{n + n!}$$

16.**
$$\sum_{k=1}^{\infty} \frac{n^2}{n + n!}$$

17.
$$\sum_{n=1}^{\infty} \frac{1}{2 + (-1)^n}$$

18.
$$\sum_{l=1}^{\infty} \frac{l^3 + \sqrt{l}}{l^5 + 3l - 1}$$

19.
$$\sum_{n=1}^{\infty} \cos(1/n)$$

20.
$$\sum_{n=2}^{\infty} \frac{1}{n(\sqrt{n} - 1)}$$