

Math 250b (Spring '08) - Homework 2

For each of the following series determine if it converges and if it converges absolutely. State the test that you use.

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

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

$$3. \sum_{n=1}^{\infty} \left(\frac{1+n}{3n} \right)^n$$

$$4. \sum_{n=1}^{\infty} \frac{(-1)^{n-1}}{2n+1}$$

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

$$6. \sum_{n=1}^{\infty} \frac{1}{r^n n!}, \quad \text{where } r > 0$$

$$7. \sum_{n=1}^{\infty} \frac{(n!)^2}{(2n)!}$$

$$8. \sum_{n=0}^{\infty} \frac{n^2}{n^4 + 1}$$

$$9. \sum_{n=1}^{\infty} \frac{(-1)^n}{2^n}$$

$$10. \sum_{n=5}^{\infty} \frac{1}{n \log(n)}$$

$$11. \sum_{n=1}^{\infty} \frac{n(n+1)}{\sqrt{n^3 + 2n^2}}$$

$$12. \sum_{n=6}^{\infty} \frac{1}{n \log^2(n)}$$

$$13. \sum_{n=1}^{\infty} (-1)^n \left(1 + \frac{1}{n^2}\right)$$

$$14. \sum_{n=1}^{\infty} \frac{(n-1)!}{n^2}$$

$$15. \sum_{n=1}^{\infty} \left(\frac{-2}{3}\right)^{n-1}$$

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

$$17. \sum_{n=1}^{\infty} \frac{3}{\ln(n^2)}$$

$$18. \sum_{n=1}^{\infty} \frac{\cos(n\pi)}{n}$$

$$19. \sum_{n=100}^{\infty} \frac{n+1}{n^2+2}$$

$$20. \sum_{n=1}^{\infty} \frac{x^{2n}}{n2^n}$$

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

22. The value of the series $\sum_{n=1}^{\infty} \frac{1}{n^2}$ is known exactly. It is of the form $r\pi^2$ where r is a rational number, i.e., a fraction. By numerically computing some partial sums of this series, make a guess for r .