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

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

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

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

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

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

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

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

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

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

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

22. The value of the series $\sum_{n=1}^{\infty} \frac{1}{n^2}$ is know 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.