CALCULUS OPTION (Q 8, PAPER 2)

LESSON NO. 2: RATIO TEST

2006

8 (c) Use the ratio test to test each of the following series for convergence. In each case, specify clearly the range of values of x for which the series converges, the range of values for which it diverges, and the value(s) of x for which the test is inconclusive.

(i) $\sum_{n=1}^{\infty} n3^n x^n$ (ii) $\sum_{n=1}^{\infty} \frac{(n+1)!n!}{(2n)!} x^n$.

ANSWERS

2006 8 (c) (i) Convergent: $|3x| < 1 \Rightarrow -\frac{1}{3} < x < \frac{1}{3}$

Divergent: $|3x| > 1 \Rightarrow x > \frac{1}{3}, x < -\frac{1}{3}$

Inconclusive: $|3x| = 1 \Rightarrow x \pm \frac{1}{3}$

(ii) Convergent: $\left|\frac{x}{4}\right| < 1 \Rightarrow -4 < x < 4$

Divergent: $\left|\frac{x}{4}\right| > 1 \Rightarrow x > 4, x < -4$

Inconclusive: $\left|\frac{x}{4}\right| = 1 \Rightarrow x = \pm 4$