Dawson College: Calculus III: 201-BZF-05 S01 September 16, 2011

Last Name: SOLUTIONS

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Quiz 3

Question 1. *(5 marks)* Test the following series for convergence or diveregence.

(a) *(5 marks)* $\sum_{n=1}^{\infty} \frac{3^n n^2}{n!}$ LET $a_n = \frac{3^n n^2}{n!}$

$$\lim_{n\to\infty} \left|\frac{a_{n+1}}{a_n}\right| = \lim_{n\to\infty} \left|\frac{3^{n+1}(n+1)^2}{(n+1)!} \cdot \frac{n!}{3^n n^2}\right| = \lim_{n\to\infty} \frac{\cancel{3^n}\cdot 3(n+1)^2 \cancel{n!}}{(n+1)\cdot\cancel{n!}\cdot\cancel{3^n}\cdot n^2}$$

$$= \lim_{n\to\infty} 3\cdot\left(\frac{n+1}{n}\right)^2\cdot\frac{1}{n+1} = 3\cdot 1\cdot 0 = 0 < 1$$

∴ THE SERIES CONVERGES (ABSOLUTELY) BY RATIO TEST

(b) *(5 marks)* $\sum_{n=1}^{\infty} (\sqrt[n]{2}-1)^n$ LET $a_n = (\sqrt[n]{2}-1)^n$

$$\lim_{n\to\infty} \sqrt[n]{|a_n|} = \lim_{n\to\infty} \sqrt[n]{|(\sqrt[n]{2}-1)^n|} = \lim_{n\to\infty}(\sqrt[n]{2}-1)$$

$$= \lim_{n\to\infty}(2^{1/n}-1) = 2^0 - 1 = 0 < 1$$

∴ THE SERIES CONVERGES (ABSOLUTELY) BY THE ROOT TEST.