September 2, 2011

Last Name: _SOLUTIONS_

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Quiz 1

Question 1. Determine if the sequence converges or diverges. If it converges find the limit.

(a) *(4 marks)* $\{n^2 e^{-n}\}$

$$\lim_{n \to \infty} a_n = \lim_{n \to \infty} n^2 e^{-n} = \lim_{n \to \infty} \frac{n^2}{e^n} \overset{(H)}{=} \lim_{n \to \infty} \frac{2n}{e^n}$$

$$(I.F. \ \infty \cdot 0) \qquad (I.F. \ \tfrac{\infty}{\infty}) \qquad (I.f. \ \tfrac{\infty}{\infty})$$

$$\overset{(H)}{=} \lim_{n \to \infty} \frac{2}{e^n} = 0$$

$$\therefore \ \text{THE SEQUENCE CONVERGES TO } 0.$$

(b) *(4 marks)* $a_n = \dfrac{\cos^2 n}{2^n}$

NOTICE $\qquad 0 \leq \cos^2 n \leq 1 \Rightarrow 0 \leq \dfrac{\cos^2 n}{2^n} \leq \dfrac{1}{2^n}$

SINCE $\lim_{n \to \infty} 0 = \lim_{n \to \infty} \dfrac{1}{2^n} = 0$,

$\lim_{n \to \infty} \dfrac{\cos^2 n}{2^n} = 0 \qquad$ BY SQUEEZE THEOREM.

Question 2. *(2 marks)* Find a formula for the general term a_n of the sequence, assuming the pattern of the first few terms continues.

$$\left\{ \frac{1}{2}, -\frac{4}{3}, \frac{9}{4}, -\frac{16}{5}, \frac{25}{6}, \ldots \right\}$$

$$a_n = (-1)^{n+1} \frac{n^2}{n+1}$$