Dawson College: Calculus II (SCIENCE): 201-NYB-05-S09: Winter 2013

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Quiz 11

This quiz is graded out of 10 marks. No books, calculators, notes or cell phones are allowed. You must show all your work, the correct answer is worth 1 mark the remaining marks are given for the work. If you need more space for your answer use the back of the page.

Question 1. *(5 marks)* §8.2 #40 If the nth partial sum of a series $\sum_{n=1}^{\infty} a_n$ is

$$s_n = 3 - n2^{-n}$$

find a_n and $\sum_{n=1}^{\infty} a_n$.

$$S_n = a_1 + a_2 + a_3 + \cdots + a_{n-1} + a_n$$

$$S_{n-1} = a_1 + a_2 + a_3 + \cdots + a_{n-1}$$

$$a_n = S_n - S_{n-1} = 3 - n2^{-n} - \left[3 - (n-1)2^{-n+1}\right] = \frac{(n-1)}{2^{n-1}} - \frac{n}{2^n}$$

$$S = \lim_{n\to\infty} S_n$$

$$= \lim_{n\to\infty}\left[3 - \frac{n}{2^n}\right] \quad \text{I.f. } \frac{\infty}{\infty} \quad n \in \mathbb{R}$$

$$\overset{H}{=} \lim_{n\to\infty}\left[3 - \frac{1}{2^n \ln 2}\right]$$

$$= 3$$

Question 2. *(4 marks)* §8.3 #28 Determine whether the series is convergent or divergent

$$\sum_{n=1}^{\infty} \frac{1+\sin n}{10^n}$$

Let $a_n = \dfrac{1+\sin n}{10^n}$

$$a_n = \frac{1+\sin n}{10^n} \leq \frac{1+1}{10^n} = \frac{2}{10^n} = 2\left(\frac{1}{10}\right)^n = b_n$$

$\sum b_n$ converges since geometric series where $r = \frac{1}{10} < 1$.

By the comparison test the series $\sum a_n$ converges.