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

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# Quiz 10

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.** *(2 marks)* §8.1 #5 Find a formula for the general term $a_n$ of the sequence, assuming that the pattern of the first few terms continues.

$\left\{-3, 2, -\frac{4}{3}, \frac{8}{9}, -\frac{16}{27}, \ldots\right\}$ $\quad a_n = (-1)^n \frac{2^{n-1}}{3^{n-2}}$

**Question 2.** *(4 marks)* §8.1 #24 Determine whether the sequence converges or diverges. If it converges, find the limit.

$a_n = \ln(n+1) - \ln n = \ln\left(\frac{n+1}{n}\right)$

Let $f(x) = \ln\left(\frac{x+1}{x}\right)$ $\quad \therefore a_n \to 0$ as $n \to \infty$

$\lim_{x\to\infty} f(x)$

$= \lim_{x\to\infty} \ln\left(\frac{x+1}{x}\right)$

$= \ln\left(\lim_{x\to\infty} \frac{x+1}{x}\right) = \ln(1) = 0$

**Question 3.** *(4 marks)* §8.1 #24 Determine whether the sequence converges or diverges. If it converges, find the limit.

$\{n^2 e^{-n}\}$

Let $f(x) = x^2 e^{-x} = \frac{x^2}{e^x}$

$\lim_{x\to\infty} f(x)$

$= \lim_{x\to\infty} \frac{x^2}{e^x}$ lif $\frac{\infty}{\infty}$ $\quad \therefore \{n^2 e^{-n}\} \to 0$ as $n \to \infty$

$\overset{H}{=} \lim_{x\to\infty} \frac{2x}{e^x}$ lif. $\frac{\infty}{\infty}$

$\overset{H}{=} \lim_{x\to\infty} \frac{2}{e^x} = 0$