MEMORIAL UNIVERSITY OF NEWFOUNDLAND

DEPARTMENT OF MATHEMATICS AND STATISTICS

TEST 1 **MATHEMATICS 2000** OCTOBER 4TH, 2004

Name	**MUN Number**

1. Determine whether the sequence $\{a_n\}$ converges or diverges. If it converges, what is its limit?

[4] (a) $a_n = \dfrac{1 - 5n^3}{2n^3 + 7n}$

[4] (b) $a_n = \dfrac{n}{\ln(n)}$

[4] (c) $a_n = \cos\left(\dfrac{\pi}{n}\right)$

2. Determine whether the given series converges or diverges. If it converges, find its sum.

[4] (a) $\displaystyle\sum_{n=1}^{\infty} \frac{(-4)^{n+1}}{7^{n-1}}$

[4] (b) $\displaystyle\sum_{n=3}^{\infty} \frac{6n}{n-2}$

[4] (c) $\displaystyle\sum_{n=1}^{\infty} \frac{4}{(2n+1)(2n+3)}$

[2] 3. (a) State the Bounded Monotonic Sequence Theorem.

[4] (b) Show that $\left\{\frac{3^n}{n!}\right\}_{n=2}^{\infty}$ is monotonic decreasing.

[4] (c) Give upper and lower bounds for $\left\{\frac{3^n}{n!}\right\}_{n=2}^{\infty}$.

[6] 4. Find all values of x such that $\sum_{n=0}^{\infty} \frac{(x-4)^n}{3^{2n}}$ converges. What is the sum of the series (in terms of x) for these values?