MEMORIAL UNIVERSITY OF NEWFOUNDLAND

DEPARTMENT OF MATHEMATICS AND STATISTICS

TEST 2 **MATHEMATICS 2000** NOVEMBER 9TH, 2018

Name	**MUN Number**

[14] 1. Determine whether each of the following series converges or diverges. Clearly indicate each test used, and show that the series meets any requirements of the test.

(a) $\displaystyle\sum_{i=1}^{\infty} \frac{4^i}{\sqrt{i}+5^i}$

(b) $\displaystyle\sum_{i=1}^{\infty} \frac{2i+7}{4i^2+3i}$

(c) $\displaystyle\sum_{i=1}^{\infty} \frac{\ln(i)+1}{i^4}$

[10] 2. Find the sum of each series, or explain why the series is divergent.

(a) $\displaystyle\sum_{i=0}^{\infty} \frac{(-1)^{i+1}6^i}{9^{i-1}}$

(b) $\displaystyle\sum_{i=1}^{\infty} \frac{2}{4i^2 + 8i + 3}$

[4] 3. Suppose $\sum a_i$ is a positive, convergent series.

(a) Can this information be used to determine $\lim\limits_{i\to\infty} a_i$? Briefly explain your answer.

(b) Can this information be used to determine whether $\sum (a_i)^2$ converges or diverges? Briefly explain your answer.

[4] 4. Suppose $w = x\ln(y) + z^3$ where $x = p\sin(q)$, $y = \sqrt{p}$ and $z = 4p - 7q$. Use the Chain Rule to find $\dfrac{\partial w}{\partial q}$.

[8] 5. Consider the function

$$f(x,y) = \frac{1}{27}x^3 + \frac{1}{9}xy - \frac{1}{18}y^2 - \frac{10}{3}x.$$

Find the (x, y) values of any critical points of $f(x, y)$ and use the Second Derivatives Test to classify the critical points as local minima, local maxima or saddle points.