5 pages

UNIVERSITY OF REGINA

DEPARTMENT OF MATHEMATICS & STATISTICS

Mathematics 212 - 001

Midterm Examination

88

October, 24

Time: 75 min

Instructor: Dr. M. Krupnik

Name: [redacted]

Student No.: [redacted]

1. Sequences. **(5)+(5)**

a) Give the general term of the sequence

$$\frac{1}{11}, \quad \frac{2}{101}, \quad \frac{3}{1001}, \quad \cdots .$$

$a_n = \frac{n}{1+10^n}$

✓

b) Find a formula for the general term a_n of the sequence

$$1, \quad \frac{1\cdot 2\cdot 3}{4}, \quad \frac{1\cdot 2\cdot 3\cdot 4\cdot 5}{16}, \quad \frac{1\cdot 2\cdot 3\cdot 4\cdot 5\cdot 6\cdot 7}{64}, \quad \cdots$$

$a_n = \frac{(2n-1)!}{4^{n-1}}$

✓

2. In the following determine whether the given series is convergent or divergent. (10)+(10)+(10)

a) $\sum_{n=1}^{\infty} \frac{2^n}{n^{10}}$ **b)** $\sum_{n=1}^{\infty} \frac{1}{(n+1)\ln(n+1)}$ **c)** $\sum_{n=1}^{\infty} (-1)^n \frac{n}{n^2+1}$

(28)

3. Determine whether the given series is convergent or divergent. If it is convergent, find its sum. (5)+(5)+(5)

(here i is imaginary unit).

a) $\sum_{n=0}^{\infty} \frac{1}{2^n}$ b) $\sum_{n=0}^{\infty} \frac{i}{3^n}$ c) $\sum_{n=0}^{\infty} (\frac{1}{2^n} + i \cdot \frac{1}{3^n})$

10

4. Find the radius of convergence and interval of convergence of the series (25)

$$\sum_{n=1}^{\infty} \frac{1}{n^2}(x-2)^n$$

5. Complex numbers. **(5)+(15)**

a) Determine which complex number is closer to the origin

$$z = 10 + 8i \quad \text{or} \quad z = 11 - 6i$$

b) Find all solutions of the equation

$$z^5 = 2$$

Good luck !