

KING FAHD UNIVERSITY OF PETROLEUM & MINERALS

DEPARTMENT OF MATHEMATICS & STATISTICS

MATH102 - Section 02 (Term 162)

Date: May 16, 2017

Test 7

Duration: 50 minutes

Family Name: _____ ID #: _____ Serial #: _____

1. Find the sum of the following series:

(a) $1 - (\ln 2) + \frac{1}{2!}(\ln 2)^2 - \frac{1}{3!}(\ln 2)^3 + \dots = \sum_{n=0}^{\infty} (-1)^n \frac{(\ln 2)^n}{n!}$

(b) $\sum_{n=0}^{\infty} (-1)^n \left(\frac{5}{6}\right)^{2n+1} \frac{\pi^{2n+1}}{(2n+1)!}$

(c) $\sum_{n=0}^{\infty} \frac{(-1)^n \pi^{2n}}{4^{2n} (2n)!}$

(4 + 4 + 4 = 12 points)

2. Find a power series representation of:

(a) $x \tan^{-1} x$

(b) $(1 + x)^{-\frac{1}{2}}$

(c) $\ln(1 - 2x)$

(4 + 4 + 4 = 12 points)

3. Suppose:

$$f(x) = a_0 + a_1x + a_2x^2 + a_3x^3 + \dots$$

Find the value of $a_0 - a_1 + a_2 - a_3$, if:

(a) $f(x) = \frac{e^{3x}}{1 - 2x}$

(c) $f(x) = (1 + x)^{-\frac{1}{2}} \cos 3x$

(6 + 6 = 12 points)

4. Find the interval of convergence of the following *power series*:

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

(b)
$$\sum_{n=1}^{\infty} \frac{n(x+2)^n}{5^{n+1}}$$

(7 + 7 = 14 points)