UAF eLEARNING & DISTANCE EDUCATION
University of Alaska Fairbanks

MATH F252X - Midterm # 2

Wedneday, October 24th

Park - Fall 2018

Date:

Print Your First & Last Name CLEARLY	Proctor Name

Start Time:	End Time:

- **Student Responsibilities**
  - It is the student's responsibility to keep track of their time. Students will be penalized for using more than the allotted time at a rate of 2 points per five minutes. **The total allotted time on this exam is 65 minutes.**
  - It is the student's respsonsibility to ensure all pages are included in order with the exam. The exam is 8 pages, including the cover sheet.
- **Specific Intructions**
  - You will have **65 minutes** to complete this exam.
  - This exam is closed book, closed notes, and you may not use a calculator.
  - In order to receive full credit you must show your work. Include your computations on the exam paper.
  - Place a box around your final answer to each question when appropriate.

Total Possible Points	Score	Percent
100 (5 Extra Credit)		

1. (12 points) Let $a_n = \cos\left(\dfrac{n+1}{n^2+3}\right)$ for $n \geq 1$.

   (a) List the first two terms in the sequence $\{a_n\}$.

   (b) Determine whether the sequence $\{a_n\}$ converges.

   (c) Let $S = \sum_{n=1}^{\infty} a_n$. Calculate s_1, and s_2, the first two terms of the sequence of partial sums. You do not need to simplify your partial sums.

   (d) Does the series $S = \sum_{n=1}^{\infty} a_n$ converge or diverge? Explain!

2. (8 points) Determine whether the series is conditionally convergent, absolutely convergent, or divergent. Explain why in each case.

   (a) $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^n}{\sqrt[3]{n^4}}$

   (b) $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^n}{\sqrt{n}}$

3. (14 points) Determine if the series below converge or diverge. Full credit will only be given for answers that include (1 pt) the name of the test being applied, (5 pts) a complete application of the test, including evidence that the conditions have been met, and (1 pt) a clear conclusion with justification.

   (a) $\displaystyle\sum_{n=1}^{\infty} \frac{n^2+1}{\sqrt{9n^8+2}}$

   (b) $\displaystyle\sum_{n=1}^{\infty} \frac{2\cos(3n)}{1+3^n}$

4. (14 points) Determine if the series below converge or diverge. Full credit will only be given for answers that include (1 pt) the name of the test being applied, (5 pts) a complete application of the test, including evidence that the conditions have been met, and (1 pt) a clear conclusion with justification.

   (a) $\displaystyle\sum_{n=1}^{\infty}(-1)^n \frac{n}{n^2+25}$

   (b) $\displaystyle\sum_{n=2}^{\infty} \frac{1}{n(\ln n)^3}$

5. (16 points) Find the radius and interval of convergence of the following series. If applicable, clearly explain why the series does or does not converge at the endpoints.

a) $\displaystyle\sum_{n=0}^{\infty} n^n (x-5)^n$

b) $\displaystyle\sum_{n=0}^{\infty} \frac{(-1)^n x^n}{(2n)!}$

(c) $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^n (x+3)^n}{n2^n}$

6. (18 points) Find the sum of the following series exactly. If the series diverges explain why.

(a) $$\sum_{n=1}^{\infty} \frac{3 \cdot 2^{2n-1}}{5^n}$$

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

(c) $$\sum_{n=1}^{\infty} (\arctan(1/(n+1)) - \arctan(1/n))$$

7. (10 points) Given $f(x) = \dfrac{x^4}{x^2+4}$.

   (a) Find a power series for $f(x)$ using a geometric series and give the radius of convergence.

   (b) Using your result from (a), evaluate $\displaystyle\int f(x)dx$ as a power series. State the radius of convergence.

8. (8 points) Find the Taylor Series for $f(x) = \dfrac{1}{x}$ centered at $a = -3$ using the definition. You must write your answer using summation notation. Simplify and cancel if applicable.

9. (5 points extra credit)

(a) (3 points) Given $f(x) = x^{5/2}$ at $a = 1$ find the 3rd degree Taylor polynomial $T_3(x)$.

(b) (2 points) Find the exact sum of $\displaystyle\sum_{n=0}^{\infty}(-1)^n \frac{2^n}{(2n)!}$