**Math 31 Sequences & Series (Part II)**

**Due: Tuesday May 5th at 11:59 PM**

**Instructions**

- Complete the following exercises on sperate sheets of paper. Scan your solutions and upload a PDF document. The file should have the following naming convention:

"Last Name First Name Assignment Name.pdf"

"Albright Charles Chapter 11 Assignment Part 2.pdf"

- Make sure your pages are numbered in the lower right-hand corner.
- Make sure each page has your full name and the name of the assignment in the upper right-hand corner of each page.
- **Note:** You do not need to include this page in your solutions.

**Solutions**

- Because of the unique circumstances of our situation, take special care with your solutions. Make sure they are complete, organized, clear and thorough. Error on the side explaining too much.
- Your final answer should be simplified and exact.

Graphs should be clear, legible and labeled.

**Math 31 Sequences & Series (Part II)**

**Series**

1. Determine whether the following series converge or diverge with proof.

a. $\sum_{k=2}^{\infty} \sqrt{k^2+1}/\sqrt{k^5+k-2}$

b. $\sum_{k=1}^{\infty} (\sqrt{k}-\sqrt{k-1})^k$

c. $\sum_{n=1}^{\infty} n \sin(1/n)$

d. $\sum_{k=1}^{\infty} \frac{\sqrt[3]{k}-1}{k(\sqrt{k}+1)}$

e. $\sum_{k=2}^{\infty} k/[(1+k^2)\ln(1+k^2)]$

f. $\sum_{k=1}^{\infty} \sqrt{k!}/k^k$

g. $\sum_{k=1}^{\infty} \frac{k \ln k}{(k+1)^3}$

h. $\sum_{k=1}^{\infty} 1/(k^2+3k+2)$

2. Determine of the following series converges conditionally or absolutely.

$$\sum_{n=1}^{\infty} (-1)^n \frac{2^n n!}{5 \cdot 8 \cdot 11 \cdot \cdots \cdot (3n+2)}$$

3. Determine of the following series converges conditionally or absolutely.

$$\sum_{n=1}^{\infty} \frac{\sin(n\pi/6)}{1+n\sqrt{n}}$$

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**Power Series**

4. Find McLaurin series for the function f defined by $f(x) = \frac{1}{(1-x)^4}$ using two different techniques.

5. Find a power series representation of the function f defined by $f(x) = \frac{1}{(1-x)^4}$ centered at a = 2.

6. Find the Taylor series for $f(x) = \ln(2+x)$ with center a = −1. Find the interval of convergence.

7. Find a power series representation and determine the interval of convergence y = sech x at a = ln(2).

8. Use a power series representation to calculate the following limits and integrals:

   a. $\lim_{x \to 0} \frac{\sin x - x + \frac{1}{6}x^3}{x^5}$

   c. $\lim_{x \to 0} \frac{\tan x - x}{x^3}$

   b. $\int \sqrt{1 + x^3}\, dx$

   d. $\int \arctan(x^2)\, dx$

9. Approximate *f* by a Taylor polynomial with degree *n* at the number *a*. Use Taylor's Inequality to estimate the accuracy of the approximation of *f* when *x* lies in the given interval.

   a. $f(x) = \ln(1 + 2x), \quad a = 1, \quad n = 3, \quad 0.5 \leqslant x \leqslant 1.5$

   b. $f(x) = e^{x^2}, \quad a = 0, \quad n = 3, \quad 0 \leqslant x \leqslant 0.1$