DIGITLE – BC CALCULUS
Puzzle 214 – Power Series

Directions: The first 5 problems have single digit or letter answers. The 6th problem has a 3-digit answer (counting leading zeros if present). You have a choice: solve the easier single-character answer problems or tackle the more difficult 3-digit answer and the multiple choice. Once you have done that, attempt to solve the puzzle by entering the following url on your computer, tablet, or phone: https://mastermathmentor.com/mmm/digitle.ashx. The correct puzzle answer will be the digits/letters of your answer(s) scrambled. Use the following interpretation. You get 6 tries. Problems should be done without graphing calculators.

Green : the digit is in the answer and is in the correct spot. Grey : the digit is not in the answer.
Yellow: the digit is in the answer but is not in the correct spot.

1) Which of the following are power series?

I. $\sum_{n=0}^{\infty}\left(n\cos\frac{\pi n}{2}\right)\left(x^n\right)$ II. $\sum_{n=0}^{\infty}\frac{x^{n\cdot n!}}{n!}$ III. $\sum_{n=1}^{\infty}\frac{n}{x^n}$

A. I and II only B. I and III only C. II and III only D. I, II, and III

2) Determine the radius of convergence for $\sum_{n=0}^{\infty}\frac{x^{2n}}{\left(-64\right)^n}$.

3) The function f is defined by the power series $1+\frac{x-1}{2}+\frac{\left(x-1\right)^2}{3}+\frac{\left(x-1\right)^3}{4}+\ldots$ for all real numbers x for which the series converges. What is the largest integer value of $k=x$ for which f converges?

4) Find the interval of convergence for $\sum_{n=1}^{\infty}\frac{\left(\frac{x}{3}-6\right)^n}{n^2}$.

A. $\left(-\infty,\infty\right)$ B. $\left(15,21\right]$ C. $\left[15,21\right)$ D. $\left[15,21\right]$

5) The function f is defined by the power series $\sum_{n=1}^{\infty}\frac{\left(\tan\frac{\pi\left(2n-1\right)}{4}\right)\left(x+2\right)^{2n}}{n!}$ for all real numbers x. If r is a value of x where f has a root and k is a value of x where f has a relative maximum, find $\left|k-r\right|$.

<u>Three Digit Answer</u>:

6) Let $f\left(x\right)=\sum_{n=0}^{\infty}\frac{\left(-1\right)^n\left(n+3\right)}{6^{n+3}}x^n$. Find $\lim_{x\to0}\frac{72-f\left(x\right)}{4x}$.