DIGITLE – BC CALCULUS
Puzzle 212 – Series Convergence

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.

Single Digit or Letter Answers:

1) Find the value of $\sum_{n=0}^{\infty}\left(\frac{4}{5}\right)^n$

2) The ratio test is applied to $\sum_{n=1}^{\infty}\frac{e^{n/4}}{(2n-1)!}$. What is the conclusion?

A. Convergent because $\lim_{n\to\infty}\frac{\sqrt[4]{e}}{4n^2+2n}>1$

B. Convergent because $\lim_{n\to\infty}\frac{\sqrt[4]{e}}{4n^2+2n}<1$

C. Divergent because $\lim_{n\to\infty}\frac{\sqrt[4]{e}}{4n^2}<1$

D. Divergent because $\lim_{n\to\infty}\frac{\sqrt[4]{e}}{4n^2}>1$

3) What is the smallest integer value of p for which the infinite series $\sum_{n=1}^{\infty}\frac{\sqrt{n}}{n^{2p-1}}$ converges?

4) Which of the following series converge?

I. $\sum_{n=1}^{\infty}\frac{8^{n-1}}{n!}$ II. $\sum_{n=4}^{\infty}\frac{n(n+2)(n-2)}{(n+3)(n+1)(n-1)(n-3)}$ III. $\sum_{n=0}^{\infty}2ne^{-n^2}$

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

5) What is the largest integer value of p for which $\sum_{n=1}^{\infty}\frac{9}{n^{3p+2}}$ and $\sum_{n=0}^{\infty}\left(\frac{3p+4}{6}\right)^n$ will both be convergent?

Three Digit Answer:

6) Find the sum of the series: $\frac{500}{2}-\frac{500}{3}+\frac{500}{4}-\frac{500}{9}+\frac{500}{8}-\frac{500}{27}+\frac{500}{16}-\frac{500}{81}+\ldots$