MAT 146

Quiz #12 (Series Convergence) Name__________________________

15 points *Calculator OK!*

Impact on Course Grade: approximately 1% Score__________________________

Show appropriate calculus evidence to fully support your responses.
Show exact values unless otherwise requested.

sequence B: $\{b_n\} = \left\{\frac{n}{n!}\right\}$

sequence C: $\{c_k\} = \left\{\frac{1}{k^4}\right\}$

$$V = \sum_{k=1}^{\infty} b_k = \sum_{k=1}^{\infty} \frac{k}{k!}$$

$$W = \sum_{n=1}^{\infty} \frac{2}{3}(4x)^{n-1}$$

$$M = \sum_{n=0}^{\infty} \frac{2n-5}{8+n^3}$$

Respond to statements 1 through 5 by circling the most correct response. (1 pt each)

1. The Harmonic Series diverges. TRUE FALSE
2. Any p-series with $p \geq 1$ converges. TRUE FALSE
3. $S = \sum_{k=1}^{\infty} a_k$ always converges when $\lim_{k\to\infty} a_k = 0$. TRUE FALSE
4. Sequence B converges. TRUE FALSE
5. If $\lim_{j\to\infty} d_j \neq 0$, then $T = \sum_{j=1}^{\infty} d_j$ must diverge. TRUE FALSE

6. Use sequence C from the box. (1 pt each)
   i. State the exact value of c_3 as a reduced common fraction. ____________

   ii. Determine $\lim_{n\to\infty} c_n$. ____________

   iii. Calculate the exact value of $N_2 = \sum_{i=1}^{2} c_i$. ____________

   iv. To the ***nearest ten-thousandth of a unit***, determine the value of $N = \sum_{k=1}^{\infty} c_k$. ________________

7. Use series M from the box above. (i: 2 pts; ii: 4 pts)
   i. Does M converge or diverge? CONVERGE DIVERGE (Circle one.)

   ii. Use one or more of our ***convergence tests*** and write a convincing argument to support your response in (7i).

BONUS! ***Show evidence to support your responses!***

Here is P_9, the 9th-degree polynomial that is part of a power series P:

$$P_9 = \frac{2}{1!}\left(\frac{x}{2}\right) - \frac{2}{3!}\left(\frac{x}{2}\right)^3 + \frac{2}{5!}\left(\frac{x}{2}\right)^5 - \frac{2}{7!}\left(\frac{x}{2}\right)^7 + \frac{2}{9!}\left(\frac{x}{2}\right)^9$$

A) State an approximation to $P_5\left(\frac{\pi}{3}\right)$ as a decimal value showing accuracy of at least 7 digits to the right of the decimal point. (1 pt)

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B) Use sigma notation and write the power series P. (1 pt) ________________

C) Graph P_n for n as large as you have patience for. Analyze your plot. Write a function, $y = f(x)$, for which the power series P could serve as a stand-in function. Explain your determination. (2 pts)

D) For $\{g_n\} = \left\{\frac{3n}{2n!}\right\}$ and $R = \sum_{n=1}^{\infty}\left[\left(\frac{4}{3}\right) g_n\right]$, determine the ***exact value*** of R, or, alternatively, show that it does not exist. (2 pts)

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