(5) I. What is the sum of this finite series? (Write your answer as a fraction, not a decimal.)

\[ 1 + \left( \frac{1}{5} \right) + \left( \frac{1}{25} \right) + \left( \frac{1}{125} \right) + \ldots + \left( \frac{1}{5} \right)^5 \]

(24) II. Give the interval of convergence and radius of convergence for these series:

A. \( 1 + (5x) + (5x)^2 + (5x)^3 + (5x)^4 + (5x)^5 + \ldots \)
II (cont’d)

B. \[ \sum_{n=1}^{\infty} \frac{x^n}{n!}. \]

C. \[ \sum_{n=0}^{\infty} \frac{x^n}{n!}. \]
III. Determine whether these series converge or diverge and explain why you know by specifying which test you used and showing how you used it.

A. \[ \sum_{n=1}^{\infty} \frac{n^6}{n^7 - 1} \]

B. \[ \sum_{n=1}^{\infty} \frac{5}{9^n} \]
III (cont’d)

C. \[ \sum_{n=1}^{\infty} \frac{3n^2}{n^3 + 1} \]

D. \[ \sum_{n=1}^{\infty} \frac{n^5}{n^7 + 1} \]

E. \[ \sum_{n=1}^{\infty} \frac{(-1)^n}{\sqrt{n}} \]
(24) IV. Give the Taylor Series for these functions

A. \( f(x) = x^4 + 7x^3 - 5x + 1 \) near \( x = 0 \).

B. \( f(x) = \ln(1 + x) \) near \( x = 0 \).

C. \( f(x) = xe^x \) near \( x = 0 \).
(7) V. Give the first four terms of the Taylor series for \( f(x) = \sin x \) near \( x = 0 \). Substitute a value for \( x \) in this formula that will give you an approximate value for \( \sin (0.1) \).