2. [7 points] The region depicted below consists of infinitely many adjacent rectangles. (Only
the first three rectangles are actually shown, and they are not necessarily drawn to scale.)
For \( n = 1, 2, 3, \ldots \), the \( n \)th rectangle has height \( a_n = \frac{1}{5^{n/2}} \) and width \( b_n = n! \).

\[
\begin{array}{c}
\text{y} \\
\quad \quad \quad a_1 \quad a_2 \quad a_3 \\
\quad \quad \quad b_1 \quad b_2 \quad b_3
\end{array}
\]

a. [5 points] Write an infinite series that gives the total volume of the solid formed by
rotating the entire region (all of the rectangles) around the \( x \)-axis.

b. [2 points] Does the infinite series that gives the total volume of the solid formed by
rotating the entire region (all of the rectangles) around the \( x \)-axis converge or diverge?

**Circle one:**

- Converges
- Diverges

State the name of the test you would use to justify your answer. If you would use the
comparison test or limit comparison also give a valid comparison series. You do not need
to actually write out a full justification. (If you do not know the name of the test you
would use, state the test itself.)