The image contains handwritten notes with mathematical expressions and equations. Here is a transcription of the visible content:

**Section 9.5**

- \[ \frac{1}{n} + \frac{1}{2n} + \frac{1}{3n} + \ldots + \frac{1}{N} = \ln N \]

- The notes include several algebraic and calculus-related equations, with annotations and calculations written in red ink.

- There are also handwritten solutions to problems, with steps and intermediate results shown.

- The notebook appears to be part of a mathematics course, possibly calculus or advanced algebra.
\[
\frac{1}{\sqrt{n-1}} > \frac{1}{\sqrt{n}}
\]

\[
(\sqrt{n})^y > (\sqrt{n-1})^y
\]

\[\begin{align*}
N &> n-1 \\
\text{Always True} \\
\text{By Direct Comparison, Our Series Diverges.}
\end{align*}\]
Oct 19-10:47 AM

Test Case

\[ \frac{2}{3} \leq \frac{x}{2} \]

Direct Comparison Test

Geometric Sequences in Non-Geometric Sequences

Terms of an \( \{ a_n \} \) \( \leq \) Terms of the \( \{ \frac{a_n}{2^n} \} \)

\[ \frac{2}{3} \leq \frac{1}{2} \]

By Direct Comparison Test

Oct 19-10:54 AM

Try It 2

\[ \frac{2}{3} \leq \frac{1}{2} \]

Direct Comparison Test

Geometric Sequences

Terms of an \( \{ a_n \} \) \( \leq \) Terms of the \( \{ \frac{a_n}{2^n} \} \)

\[ \frac{2}{3} \leq \frac{1}{2} \]

By Direct Comparison Test

Oct 19-11:05 AM

\[ \frac{2}{3} \leq \frac{1}{2} \]

Direct Comparison Test

Geometric Sequences

Terms of an \( \{ a_n \} \) \( \leq \) Terms of the \( \{ \frac{a_n}{2^n} \} \)

\[ \frac{2}{3} \leq \frac{1}{2} \]

By Direct Comparison Test

\[ \frac{2}{3} \leq \frac{1}{2} \]

By Direct Comparison Test
\[ \lim_{n \to \infty} \frac{1}{n^2} = 0 \]

Try It:

\[ \lim_{n \to \infty} \frac{1}{n} = 0 \]

Limit Comparison Test:

\[ \lim_{n \to \infty} \frac{\frac{1}{n^2}}{\frac{1}{n^2}} = 1 \]

By Limit Comparison Test, converges.

p-value = \[ \int_{a}^{\infty} f(x) \, dx = \frac{1}{2} \]

\[ \int_{a}^{\infty} \frac{1}{x^2} \, dx = \frac{1}{a} \]