Math 76 Assessment 13 §5.3 The Divergence and Integral Tests

Things to remember:

1. The problem to complete is shown below. Write your name and solution on the next page where instructed.

2. Please make sure your full name is written neatly in the box.

3. Your score will be determined by **Mechanics** (2 points) and by **Content** (3 points).

4. The following rubric will be used for **Mechanics**:

Clear neat work, steps in order and easily followed, proper use of notation	2
Mostly clear work; minor errors in notation or skipped steps	1.5
Steps/handwriting hard to follow/read; major errors in notation	1
No discernible or relevant work, or work impossible to read/follow	0

5. You are not allowed to consult outside sources, including notes, books, the internet, or other people, while taking this assessment. Calculators are allowed only for basic numerical or scientific computations, not for graphing or algebra.

6. If you need more room, you may finish on a plain piece of paper or blank document. If you do all your work on separate sheets, please **copy the problem** and make sure to write **Version D** at the top of the first page.

7. When you are finished, create a legible, well-lit **.pdf file** of your work and upload it to Assessment 13 on Gradescope. Please follow the directions to **assign the page(s)** of your submission that contain your work for the question. More info about submitting to Gradescope:

   `http://bit.ly/gradescope-help`

Evaluate the series on the next page using the Integral Test.

Your solution should include:

- (1 point) Correct explanation of why the Integral Test is a valid test for the series;
- (1 point) Correct evaluation of the improper integral used in applying the Integral Test;
- (1 point) Correct conclusion (converges/diverges), with correct explanation.

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Version D

Follow the directions on the previous page. Use the Integral Test to determine whether the series

$$\sum_{n=5}^{\infty} \frac{2}{n(\ln n)^6}$$

converges or diverges.

The function $f(x) = \frac{2}{n(\ln(n))^6}$ must be Continuous, Positive and decreasing to be able to use the integral test.

Continuous: The only time we would have an issue is if $n=0$ or $n=1$ We are going from $5 \to \infty$ so its continuous. ✓

Positive: We are going from $5 \to \infty$ and All the outputs are Positive ✓

decreasing: The numerator is fixed at 2 and the bottom is growing exponentially so its always decreasing. ✓

$$\sum_{n=5}^{\infty} \frac{2}{n(\ln(n))^6} = 2\int_5^{\infty} \frac{1}{n(\ln(n))^6} \qquad U = \ln(n) \qquad dU = \frac{1}{n}\,dx$$

$$= 2\int_5^{\infty} \frac{1}{U^6}\,dU = -\frac{2}{5\ln(n)^5}\Bigg|_5^{\infty}$$

$$\left(0 - \left(-\frac{2}{5\ln(5)^5}\right)\right) = \boxed{\frac{2}{5\ln(5)^5}} \checkmark$$

$\sum_{n=5}^{\infty} \frac{2}{n(\ln n)^6}$ Converges at $\frac{2}{5\ln(5)^5}$ ✓