Instructions: Time is 20 minutes and the total score is 10 points. For #2 and the extra problems (if you do), you CAN’T give only final answers, or you won’t get points even if you are right, because they are mostly from homework.

1. Choose ANY ONE of the two below. (2 points)
   - Which one is zero? (Please Circle.)
     A. \( \lim_{n \to \infty} \frac{n}{(\ln n)^4} \)  
     B. \( \lim_{n \to \infty} \frac{100n^3}{e^{n/2}} \)  
     C. \( \lim_{n \to \infty} \frac{n!}{n^2} \)  
     D. \( \lim_{n \to \infty} \frac{n^n}{n!} \)
   - When does \( \sum_{n=1}^{\infty} \frac{1}{n^p} \) converge? (Circle one.)
     A. \( p \geq 0 \)  
     B. \( p < 0 \)  
     C. \( p \geq 1 \)  
     D. \( p > 1 \)

2. 1). Find the limit of ANY ONE of the two from Homework 5. (2 pts)
    \( a_n = \left( \frac{1}{n} \right)^{1/(\ln n)} \)  
    \( a_n = \sqrt[n]{n^2} \)

2). Find the sum of the Geometric Series from Homework 5:
    \( \sum_{n=0}^{\infty} \left( \frac{2^{n+1}}{3^n} \right) \) (3 pts)(Pay attention to the sub-index)

Use the Integral Test to decide when the series from Homework 5 converges:
    \( \sum_{n=2}^{\infty} \frac{1}{n(\ln n)^p} \) (3 pts)
(Bonus) Choose **ANY ONE** of the three below. (3pts)

- Does \(\sum_{n=2}^{\infty} \frac{1}{\sqrt{n \ln n}}\) converge or not? (2 pts)

  How about \(\sum_{n=2}^{\infty} \frac{1}{n^p \ln n}\) \((0 < p \leq 1)\)? (1 pt)

- Does \(\sum_{n=1}^{\infty} \frac{(\ln n)^2}{n^3}\) converge or not? (2 pts)

  How about \(\sum_{n=1}^{\infty} \frac{(\ln n)^q}{n^p}\) \((p > 1, q > 1)\)? (1 pt)

- Does \(\frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + \ldots + \frac{1}{(2k-1)^2} + \frac{1}{(2k)^2} + \ldots\) converge? (1 pt)

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\lim_{n \to \infty} \frac{\sin n}{n} \quad (1 \text{ pt})
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\lim_{n \to \infty} \frac{\sin(1/n)}{1/n} \quad (1 \text{ pt})
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