MTH 174, Quiz #12, Spring 2018 Name KEY

Instructions: Show all work. Use exact answers unless otherwise asked to round.

1. Determine the convergence or divergence of the sequence.

   a. $a_n = \frac{\ln n^3}{2n}$

$$\lim_{n\to\infty} \frac{\ln(n^3)}{2n} = \lim_{n\to\infty} \frac{3\ln n}{2n} = \lim_{n\to\infty} \frac{3\cdot\frac{1}{n}}{2} = 0$$

   b. $a_n = ne^{-n/2}$

$$\lim_{n\to\infty} ne^{-n/2} = \lim_{n\to\infty} \frac{n}{e^{n/2}} = \lim_{n\to\infty} \frac{1}{\frac{1}{2}e^{n/2}} = 0$$

2. Find the sum of the convergent geometric series $\sum_{n=0}^{\infty}\left(-\frac{1}{5}\right)^n$.

$r = -\frac{1}{5}$

$$S = \frac{1}{1-(-1/5)} = \frac{1}{6/5} = \frac{5}{6}$$

3. Write $\sum_{n=1}^{\infty} \ln\frac{n+1}{n}$ as a telescoping series, then determine if the series converges or diverges.

$$\sum_{i=1}^{\infty} \ln(n+1) - \ln(n) \qquad \text{diverges}$$

$$= \lim_{n\to\infty} \ln(n+1) - \ln(1) = \infty$$