WORKSHEET 3: SERIES

Determine if the sequence $\left\{\frac{\ln x}{x^2}\right\}$ converges, if so, to what?

1. Determine if the following series converge or diverge. Name the test used and the criteria of each test used.

a. $\sum_{n=1}^{\infty}\frac{1+3n^2+n^3}{4n^3-5n+2}$

b. $\sum_{n=0}^{\infty}\left(\frac{2}{7}\right)^n$

c. $\sum_{n=1}^{\infty}\frac{4}{n^3}$

d. $\sum_{n=1}^{\infty}\frac{n^2}{5^n}$

e. $\sum_{n=1}^{\infty}\frac{1}{\sqrt[3]{n^5+5}}$

f. $\sum_{n=1}^{\infty}\frac{4}{n^3}$

g. $\sum_{n=1}^{\infty}\frac{5n^2-6n+3}{n^3-7n+8}$

h. $\sum_{n=1}^{\infty}\frac{\cos n\pi}{\sqrt{n}}$

i. $\sum_{n=1}^{\infty}\frac{3^n+4}{2^n}$

j. $\sum_{n=1}^{\infty}\frac{8n^3-6n^5}{12n^4-9n^5}$

k. $\sum_{n=1}^{\infty}\sqrt{\frac{3n+1}{n^5+2}}$

l. $\sum_{n=1}^{\infty}\frac{3^{n-1}}{n2^n}$

m. $\sum_{n=1}^{\infty}\left(\frac{2n}{5n-1}\right)^n$

n. $\sum_{n=2}^{\infty}\frac{1}{(\ln n)^n}$

2. Determine if the series $\sum_{n=1}^{\infty}\frac{(-1)^n}{\sqrt[5]{3n+4}}$ converges absolutely, converges conditionally, or diverges.

3. What is the sum of the following:

a. $\sum_{n=0}^{\infty}\frac{3}{2^n}$ b. $\sum_{n=2}^{\infty}\left(-\frac{3}{2}\right)^{-n}$ c. $\sum_{n=1}^{\infty}\left(\frac{1}{n+1}-\frac{1}{n+3}\right)$ d. $\sum_{n=1}^{\infty}\frac{3}{(2n-1)(2n+1)}$

4. (Multiple Choice) If the series $\sum_{n=1}^{\infty}a_n$ is conditionally convergent, determine which of the following series must diverge (there may be more than one correct answer). Justify each correct answer.

a. $\sum_{n=1}^{\infty}a_n^2$ b. $\sum_{n=1}^{\infty}|a_n|$ c. $\sum_{n=1}^{\infty}(-1)^{2n}a_n$ d. $\sum_{n=1}^{\infty}(-a_n)$ e. None of these

5. Consider the series $\sum_{n=1}^{\infty}\frac{(-1)^n}{2^n}$

   a. Show that the series is absolutely convergent.
   b. Calculate S_6, the sum of the first six terms. Round your answer to three decimal places.
   c. Find the number of terms necessary to approximate the sum of the series with an error less than 0.001

6. (Multiple Choice) Choose the best answer. (Use the fourth partial sum) $S=\sum_{n=1}^{\infty}\frac{4}{n^2}$

a. $\frac{89}{18}<S<\frac{49}{9}$ b. $\frac{107}{18}<S<\frac{58}{9}$ c. $\frac{49}{9}<S<\frac{107}{18}$ d. $\frac{58}{9}<S<\frac{125}{18}$