Math 1220 - Series Worksheet

Instructions:
This is an optional worksheet designed to help the student become more comfortable with analyzing series. Remember the scientific method! When approaching a problem:

1. Form a Hypothesis: Do you think the series will converge or diverge?

2. Choose a test to use: Does the series satisfy any necessary conditions to use this test? (*Do the terms of the series need to positive?*)

3. Perform the test.

4. Analyze results from the test. ($L = 2...$ *So what?*)

5. Perform another test if the results were inconclusive.

6. Report results of test. *Does it converge or not?!*

1. Determine if the following series converge or diverge.

   (a) $\displaystyle\sum_{n=0}^{\infty} 2\left(\frac{1}{4}\right)^n$

   (b) $\displaystyle\sum_{n=2}^{\infty} e^n$

(c) $\displaystyle\sum_{n=1}^{\infty} \frac{n^2 + 2}{3n^2 + n}$

(d) $\displaystyle\sum_{n=0}^{\infty} \cos(n)$

(e) $\displaystyle\sum_{n=1}^{\infty} \ln(n)$

(f) $\displaystyle\sum_{n=0}^{\infty} 10^{-50}$

(g) $\displaystyle\sum_{n=3}^{\infty} \frac{1}{n-2}$

(h) $\displaystyle\sum_{n=0}^{\infty} \frac{1}{n+2}$

(i) $\displaystyle\sum_{n=0}^{\infty} \frac{1}{n^2+4}$

(j) $\displaystyle\sum_{n=0}^{\infty} \frac{1}{n^2-4}$

(k) $\displaystyle\sum_{n=0}^{\infty} \frac{1}{3^n - 2}$

(l) $\displaystyle\sum_{n=0}^{\infty} \frac{1}{3^n + 2}$

(m) $\displaystyle\sum_{n=0}^{\infty} \frac{5^n + 2}{4^n}$

(n) $\displaystyle\sum_{n=0}^{\infty} \frac{5^n - 2}{4^n}$

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

(p) $\displaystyle\sum_{n=1}^{\infty} \frac{1}{n4^n}$

(q) $\displaystyle\sum_{n=1}^{\infty} \frac{1}{n^{10}}$

(r) $\displaystyle\sum_{n=1}^{\infty} \frac{1}{n^{-2}}$

(s) $\displaystyle\sum_{n=1}^{\infty} \frac{1}{\sqrt[3]{n}}$

(t) $\displaystyle\sum_{n=1}^{\infty} \frac{1}{\sqrt{n^5}}$

(u) $\displaystyle\sum_{n=2}^{\infty} (-1)^n \frac{1}{\ln(n)}$

(v) $\displaystyle\sum_{n=1}^{\infty} (-1)^n \cos\left(\frac{\pi}{n}\right)$

(w) $\displaystyle\sum_{n=1}^{\infty} (-1)^{n-1} \sin\left(\frac{\pi}{n}\right)$

(x) $\displaystyle\sum_{n=1}^{\infty} (-1)^n \frac{n^2 + 2}{3n^2 + n}$

(y) $\displaystyle\sum_{n=1}^{\infty} (-1)^n$

(z) $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^n}{100}$

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

(b) $\displaystyle\sum_{n=1}^{\infty}\frac{4^n}{n}$

(c) $\displaystyle\sum_{n=1}^{\infty}\frac{n}{4^n}$

(d) $\displaystyle\sum_{n=1}^{\infty}\frac{n^2+1}{3^n}$

(e) $\displaystyle\sum_{n=0}^{\infty} n\left(\frac{2}{3}\right)^{n}$

(f) $\displaystyle\sum_{n=0}^{\infty} n^{3}\left(\frac{2}{3}\right)^{n}$

(g) $\displaystyle\sum_{n=0}^{\infty} \frac{n!}{10^{n}}$

(h) $\displaystyle\sum_{n=0}^{\infty} \frac{10^{n}}{n!}$

(i) $\displaystyle\sum_{n=0}^{\infty} \frac{n^n}{10^n}$

(j) $\displaystyle\sum_{n=0}^{\infty} \frac{10^n}{n^n}$

(k) $\displaystyle\sum_{n=1}^{\infty} \frac{n!}{n^n}$

(l) $\displaystyle\sum_{n=1}^{\infty} \frac{n^n}{n!}$