Due at the beginning of class on the day of Test 3

Direction: Solve the problems in this worksheet on separate sheets of paper. Write your solution neatly. Use standard size paper. Clearly label each problem, and include each problem in the correct order. No ragged edges. Staple multiple pages. At the top of the first page put your name, Math 2414, and the title of the worksheet.Show all work to justify your answer. Answer with insufficient work will receive no credit.

Problem 1: Using direct comparison test - compare with geometric series

Determine whether the series converges or diverges

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

Problem 2: Using direct comparison test - compare with p-series

Determine whether the series converges or diverges

1. $\displaystyle\sum_{n=1}^{\infty} \frac{1}{2n-1}$
2. $\displaystyle\sum_{n=1}^{\infty} \frac{1}{\sqrt{n^3+1}}$
3. $\displaystyle\sum_{n=1}^{\infty} \frac{1}{4\sqrt[3]{n}-1}$

Problem 3: Using limit comparison test

Determine whether the series converges or diverges

1. $\displaystyle\sum_{n=1}^{\infty} \frac{2n^2-1}{3n^5+2n+1}$
2. $\displaystyle\sum_{n=1}^{\infty} \frac{1}{n\sqrt{n^2+1}}$
3. $\displaystyle\sum_{n=1}^{\infty} \frac{n}{(n+1)2^{n-1}}$
4. $\displaystyle\sum_{n=1}^{\infty} \frac{2^n+1}{5^n+1}$
5. $\displaystyle\sum_{n=1}^{\infty} \sin\left(\frac{1}{n}\right)$
6. $\displaystyle\sum_{n=1}^{\infty} \frac{e^{1/n}}{n}$

Problem 4: Optional Extra Credit Problem

If the limit in the limit comparison test is zero or infinity, the test is still applicable in some cases.
In particular, suppose that $\sum a_n$ and $\sum b_n$ are series with positive terms. If the series $\sum b_n$ is convergent, and the limit $\displaystyle\lim_{n\to\infty} \frac{a_n}{b_n} = 0$, then the series $\sum a_n$ must be convergent. On the other hand, if the series $\sum b_n$ is divergent and the limit $\displaystyle\lim_{n\to\infty} \frac{a_n}{b_n} = \infty$, then the series $\sum a_n$ must be divergent. Use these facts to show that the series

1. $\displaystyle\sum_{n=1}^{\infty} \frac{\ln n}{n^3}$ converges.
2. $\displaystyle\sum_{n=1}^{\infty} \frac{\ln n}{n}$ diverges.