The following written homework problems are due on Gradescope at 6pm the day before class. You also have WeBWorK.

(11.1) Use the Copmarison Test or Limit Comparison Test to determine the convergence or divergence of the following series.

(a) $\displaystyle\sum_{n=1}^{\infty} \frac{4^n}{3^n + 2^n}$

(b) $\displaystyle\sum_{n=3}^{\infty} \frac{n}{n^5 - 2}$

(11.2) Use the Integral Test to determine whether $\displaystyle\sum_{n=1}^{\infty} \frac{n^2}{n^3 + 7}$ converges or diverges. Make sure to check the conditions for the Integral Test and justify its use.

(11.3) Suppose $\displaystyle\sum_{n=1}^{\infty} a_n$ and $\displaystyle\sum_{n=1}^{\infty} b_n$ are both convergent series with positive terms.

(a) Explain why, eventually, $0 \leq a_n < 1$.
In other words, explain why there exists a number N such that $0 \leq a_n < 1$ once $N < n$.

(b) Use the Comparison Test to prove $\displaystyle\sum_{n=1}^{\infty} a_n b_n$ is also convergent.

(11.4) **Professional Problem**. Suppose $\displaystyle\sum_{n=1}^{\infty} a_n$ is a convergent series with positive terms, and $\displaystyle\sum_{n=1}^{\infty} b_n$ is a divergent series with positive terms.

(a) Prove $\displaystyle\sum_{n=1}^{\infty} \sin(a_n)$ always converges or find a counterexample to show it could diverge.

(b) Prove $\displaystyle\sum_{n=1}^{\infty} \cos(a_n)$ always converges or find a counterexample to show it could diverge.

(c) Prove $\displaystyle\sum_{n=1}^{\infty} \sin(b_n)$ always diverges or find a counterexample to show it could converge.

As always, refer to the "Professional Problem information" handout to create a *professionally written* solution. This week, you should especially focus on:

Explanation: Justify any theorem you use by showing you have checked its hypotheses. Explain why any counterexample is a counterexample. Solutions that are not appropriately explained are not acceptable.

Organization & Structure: Your solution should be short! Each part can amount to a few lines. Rewrite, revise, and hand in a beautiful final result.

You should have questions!

When you do, here's what to do:

1. Post your question on Canvas.
2. Email *all* of the instructors with your question.
3. Write your solution (even if you're unsure about it) and bring it to the study session. Ask an instructor specific questions about it.

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