Each problem is worth 10 points. For full credit provide complete justification for your answers.

1. Write a 5th degree MacLaurin polynomial for sin $x$.

2. Give an example of a series which converges, but does not converge absolutely.
3. Determine whether the series \( \sum_{n=0}^{\infty} \frac{\sqrt{n+1}}{2^n} \) converges or diverges.

4. Determine the interval of convergence of the MacLaurin polynomial for \( f(x) = e^x \).
5. Determine whether the series \( \sum_{n=2}^{\infty} \frac{1}{n \ln n} \) converges or diverges.

6. Find the 2\(^{nd}\)-degree Taylor polynomial for \( f(x) = \sqrt[3]{1+x} \) centered at \( x = 7 \).
7. Biff is a calculus student at Enormous State University, and he’s having some trouble. Biff says “Dude, I think I’m in trouble. This series stuff is pretty confusing, and all these different tests they’ve got are pretty crazy. I’ve got some of it figured out, but what I don’t get is are there times when you’ve gotta use the comparison test instead of the limit comparison?”

Help Biff by answering his questions as clearly as possible.
8. Is \( x = 1 \) included in the interval of convergence of the power series \( \sum_{n=0}^{\infty} (-1)^n \frac{x^{2n+1}}{2n+1} \)?
9. Use a 4\textsuperscript{th}-degree MacLaurin polynomial for $\cos(x^2)$ to approximate $\int_0^{0.1} \cos(x^2)\,dx$ to the nearest millionth.
10. Suppose \( \sum_{n=1}^{\infty} a_n \) is a convergent series with all of its terms positive. What can you say about
\[
\sum_{n=1}^{\infty} \left( \frac{n+1}{n} a_n \right) ?
\]

Extra Credit (5 points possible):
What is the sum of the series \( \sum_{n=3}^{\infty} \frac{(-1)^{n+1}}{n} \)?