1. Determine whether the following series converge:

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

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

   (c)
   $$\sum_{n=1}^{\infty} \frac{\sin\left(\frac{1}{n}\right)}{n}.$$

2. Evaluate the improper integral
   $$\int_{2}^{\infty} \frac{1}{x\sqrt{x^2 - 1}} dx.$$

3. Use Taylor polynomials to approximate $\sin(.8)$ to within $\pm 10^{-4}$.

4. (a) Find the Taylor series for $\ln(1 + x^6)$.

   (b) Using the power series above, what complex power series would you use to define $f(z) = \ln(1 + x^6)$ in the complex plane?

   (c) What is the radius of convergence R of this power series?

   (d) Find two values of $z \in \mathbb{C}$ with $||z|| = R$ such that $f(z)$ converges, and two more values of $z \in \mathbb{C}, ||z|| = R$ such that $f(z)$ diverges.