1) Determine whether the following sequence converges or diverges. If it converges, find the limit. \( a_n = \frac{\sin^2 n}{n} \)

2) Use the integral test to determine whether the following series converges or diverges. \[ \sum_{n=2}^{\infty} \frac{1}{n \ln n} \]
3) Determine whether each of the following series is convergent or divergent. Be sure to explain your reasoning.

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

b) \( \sum_{n=1}^{\infty} \frac{4^n}{7^{n-1}} \)

4) Determine whether each of the following series is conditionally convergent, absolutely convergent or divergent. Be sure to explain your reasoning.

a) \( \sum_{n=1}^{\infty} \frac{n!}{e^n} \)

b) \( \sum_{n=2}^{\infty} \frac{(-1)^n}{\sqrt[3]{n}} \)
5) Determine the radius of convergence of the following series.

\[
\sum_{n=1}^{\infty} \frac{(x - 3)^n}{n^n}
\]

6) Write a Taylor series for \( f(x) = e^x \) centered at \( a = 2 \).

7) Find the sum of the following series:

\[
\sum_{n=0}^{\infty} (-1)^n \frac{\pi^{2n}}{(2n)!}
\]

8) \( \int \frac{\sin x}{x} \, dx \) does not have an elementary antiderivative. Evaluate the indefinite integral as an infinite series.
9) a) Given \( f(x) = \sqrt{x} \) approximate \( f \) by a Taylor polynomial with degree 2 at 4.

b) Use Taylor’s Formula to estimate the accuracy of your approximation in part a when \( x \) lies in [4,4.2].