1. Find the second degree Taylor polynomial for \( \ln(x) \) centered at \( x = 10 \). Use Taylor’s inequality to bound the error on the interval (6, 14).

2. Approximate \( e^{0.4} \) with a third degree Taylor polynomial centered at \( x = 0 \). Use Taylor’s Inequality to bound your error.

3. How many terms of the Maclaurin series for \( \cos(2x) \) should we use in order to get an estimate for \( \cos(2x) \) to within \( 10^{-6} \) on the interval \((-\frac{1}{3}, \frac{1}{3})\)?

4. Suppose we want to use the Maclaurin series for \( \sin(x) \) to estimate \( \sin(40) \). Use Taylor’s Inequality to determine the degree of the Taylor approximation we should use in order to get the answer to within 0.001.

5. (a) Use Taylor’s Inequality to find a radius \( d \) such that the fourth order Taylor polynomial of \( f(x) = \sin(3x) \) centered at 2 is accurate to within 0.1 on the interval \((2 - d, 2 + d)\).

(b) Use Mathematica to plot both \( \sin(3x) \) and the fourth order Taylor polynomial from (a). Choose appropriate intervals for the domain and range so that the graph clearly shows where the Taylor polynomial starts to diverge from the original function. Mark your answer to (a) on the graph by shading in the interval \((2 - d, 2 + d)\) on the \( x \)-axis.

6. (a) Give an example of a series \( \sum a_n \) where \( \sum a_n \) diverges but \( \sum a_n^2 \) converges. Explain your answer.

(b) Give an example of a series \( \sum a_n \) where \( \sum a_n \) converges but \( \sum a_n^2 \) diverges. Explain your answer.

7. Consider the series \( \frac{5}{6} - \frac{5}{9} + \frac{5}{12} - \frac{5}{15} + \cdots \)

(a) Find an explicit formula for this series.

(b) Is the series absolutely convergent? Why or why not?

(c) Is the series convergent? Why or why not?