1) Use the Taylor polynomial $P_3(x; 0)$ to estimate each of the following. Use a calculator to compare your estimate to the exact value.

   a.) $e^{0.1}$    b.) $e^4$
   c.) $\sin(0.2)$    d.) $\ln(1.5)$

2) Compute the first four nonzero terms of the Taylor series about $a=1$ for each of the following.

   a.) $e^x$    b.) $\sqrt{x}$

3) a.) Use the first six terms of the Maclaurin series for $e^{-x}$ to estimate $e^{-1}$.

   b.) Estimate the error in part a.) using

      i.) $|R_n| < a_{n+1}$ for alternating series

      ii.) $|R_n(x; a)| = \left| \frac{f^{(n+1)}(c)}{(n+1)!}(x-a)^{n+1} \right|$, the Taylor remainder

      iii.) a calculator
4.) Expand \( f(x) = 3x^4 - x^3 + 2x^2 - x + 5 \) in powers of \( (x-1) \).

5.) For each of the following, show that the Taylor remainder \( R_n(x;0) \to 0 \) as \( n \to \infty \) for the indicated values of \( x \).

   a.) \( e^x \) for all values of \( x \)
   b.) \( \ln(1+x) \) for \( \frac{-1}{2} < x < 1 \)

6.) Consider the integral \( \int_0^1 \cos \sqrt{x} \, dx \).

   a.) Using an appropriate Taylor series, estimate the exact value of the integral with an accuracy of 0.00001.
   b.) Evaluate the integral using the Fundamental Theorem of Calculus.