1. Round 

\[ e = 2.71828182845905 \ldots \]

to 5 decimal digits. Evaluate the absolute and relative errors and the number of significant digits. Repeat this for \( e \times 10^{10^3} \).

2. Consider the following iteration:

\[ x_{n+1} = x_n - \sin(ax_n), \quad x_0 = 1/2 \]

Describe the convergence properties of this sequence (including the rate, if convergent) in two cases:

a) \( a = \pi \),  

b) \( a = 1 \).

3. Construct the Hermite polynomial, \( H(x) \), which interpolates

\[ \sin \left( \frac{\pi x}{2} \right) \text{ at } x_0 = 0, \ x_1 = 1. \]

Show that

\[ |\sin(\pi x/2) - H(x)| \leq \frac{1}{24}, \quad 0 \leq x \leq 1. \]