1. Find a real root of $x^3 - 2x - 2 = 0$ by bisection method: start with $[a_0, b_0] = [0, 2]$. Find $[a_4, b_4]$. What is an estimate of the error if one takes $x_0 = (a_4 + b_4)/2$?

$$a_0 = 0, b_0 = 2, c_0 = \frac{a_0 + b_0}{2} = 1, \quad a_0 < 0, f(b_0) > 0, f(c_0) < 0$$

Then $a_1 = c_0 = 1, b_1 = b_0 = 2, c_1 = \frac{a_1 + b_1}{2} = 1.5$

$$f(a_1) = f(c_1) < 0, f(b_1) > 0, f(c_1) < 0$$

Then $a_2 = c_1 = 1.5, b_2 = b_1 = 2, c_2 = \frac{a_2 + b_2}{2} = 1.75$

(Continue this procedure...)

2. Find a root with error tolerance $\epsilon = 10^{-3}$.

$$n \geq \log_2 \left( \frac{b_0 - a_0}{\epsilon} \right) - 1 = \log_2 \left( \frac{2 - 0}{10^{-3}} \right) - 1 \approx 9.96$$

Thus, by taking $x_0 = \frac{a_0 + b_0}{2}$, one obtains an approximate root with precision $\epsilon$.

To find $a_{10}$ and $b_{10}$, one continues the procedure in Problem 1 six more times.