Homework 2: Method of Bisection.

Write a small code using this method that systematically reduces the interval of uncertainty by function comparison to find zeroes of the parabola:

\[ f(x) = x^2 - 4 \]

for 2 initial intervals

\([-4.0, 0.0]\]

\([+5.0, 0.0]\]

for small tolerance:

\[ |a - b| < \varepsilon \]
\[ \varepsilon = 10^{-3} \]

You evaluate \( f \) at midpoint of the interval and always create a new interval of uncertainty by discarding the value of \( a \) or \( b \) depending on whether \( f(a) \) or \( f(b) \) agrees in sign with \( f \) at the midpoint of the interval.

Show that you obtain the 2 zero crossings of the parabola at +2.0 and −2.0 respectively.

Estimate the number of iterations necessary to attain given accuracy using number of function evaluations:

\[ \log_2\left(\frac{(b-a)}{\varepsilon}\right) \]