Approaches:

Non-Linear Equations
- Bracketing — (Regula-Falsi)
  - Bisection
  - False Position
- Graphical
- Open Methods — Newton Raphson
  - Secant

## 1 The Bisection Method (二分法)

① Pick $X_L$ $X_U$, if $f(X_L) \times f(X_U) < 0$, then they bound the root.

② 查看 $f[(X_L + X_U)/2]$ 的符号.

③ Find the pair. 3.1. if $f(X_L) \times f[(X_L + X_U)/2] < 0$

$X_U = (X_L + X_U)/2$. 重代到 ②.

else, $X_L = (X_L + X_U)/2$. → ②.

当 $f(X_L) \times f[(X_L + X_U)/2] = 0$. root is $\frac{(X_L + X_U)}{2}$

④ 比较 criterion $\varepsilon_s$ 和 approximate percent relative error $\varepsilon_a$.

如果 $\varepsilon_a < \varepsilon_s$, stop.

否则 repeat or $X_U$

$$\left( \frac{\left| \vec{X_I} - \frac{X_I + X_U}{2} \right|}{\left| \frac{X_I + X_U}{2} \right|} < 100\% \right)$$

二分法 about error

n步二分法操作后，求解误差 $= |X_C - Y| < \frac{b-a}{2^{n+1}}$

假设初始区间长度为1，需要最后解果精确到小数点后6位.

$$\frac{1}{2^{n+1}} < 0.5 \times 10^{-6}$$

$$n > \frac{6}{\log_{10}^2} \approx 19.9.$$ 需要20次迭代.