(1) Determine the minimum point of the function $f(x) = x^2 - 7x + 12$ with Dichotomous search method, when $[a, b] = [2, 4]$, $\delta = 0.3$, $\epsilon = 0.4$

Sol^n step 1. $[a_1, b_1] = [2, 4]$, $L_1 = 2$.

$c_1 = a_1 + \frac{L_1}{2} - \delta = 2.7$, $f(c_1) = 0.39$

$d_1 = a_1 + \frac{L_1}{2} + \delta = 3.3$ $f(d_1) = -0.21$

step2 $f(c_1) > f(d_1)$ then the new uncertainty ~~level~~ interval is $[a_2, b_2] = [2.7, 4]$ which length is $L_2 = 1.3$. The two test points

$c_2 = 3.05$, $f(c_2) = -0.0475$

$d_2 = 3.65$ $f(d_2) = -0.2275$

$f(c_2) > f(d_2)$, $[a_3, b_3] = [3.05, 4]$, $L_3 = 0.95$

$c_3 = 3.225$ $f(c_3) = -174375$

$d_3 = 3.825$ $f(d_3) = 0.144375$

$f(c_3) < f(d_3)$, $[a_4, b_4] = [3.05, 3.825]$

$L_4 = 0.775 < 2\epsilon$, we stop.

midpoint of the last interval

$$x^* = \frac{3.05 + 3.825}{2} = 3.4375$$

$f(x^*)$

Solve using → Golden Selection search method

Ex $f(x) = x^2 + 54/x$

$a = 0,\ b = \cancel{5}\ 1$

$L_1 = \cancel{5}$

$c_1 = a_1 + 0.382 L_1 = 0.382$, $f(c_1) = 31.92$

$d_1 = a_1 + 0.6\cancel{78}8 L_1 = \cancel{0.68}\ 0.618$ $f(d_1) = 27.02$

$f(c_1) > f(d_1)$, $[a_2, b_2] = [0.382, 1]$

$L_2 = 1 - 0.382 = 0.618$

$c_2 = d_1 = 0.618$

$d_2 = 0.382 + (0.618) \times 0.618 = 0.764$

$f(d_2) = 28.73$, $f(c_2) = 27.02$

$f(c_2) < f(d_2)$

$[a_3, b_3] = [0.382, 0.764]$, $L_3 = 0.764 - 0.382 = 0.382$

$c_3 = 0.528$

$d_3 = c_2 = 0.618$

$f(c_3) = 27.43$, $f(d_3) = 27.02$

$f(c_3) > f(d_3)$

$[a_4, b_4] = [0.528, 0.764]$, $L_4 = 0.764 - 0.528 = 0.236$

~~Accuracy is $(0.618)^{n-1}$ $(b-a) = \epsilon$~~