

2. โจทย์ Bisection คำนวณ $\sqrt[4]{13}$ โดยกำหนดช่วงเริ่มต้นไว้ที่ $[1.5, 2.0]$

2.1 in 4 iteration

$$x = \sqrt[4]{13} \rightarrow x^4 = 13$$

$$f(x) = x^4 - 13$$

$$x_L = 1.5, x_R = 2.0, x_m = \frac{x_L + x_R}{2}$$

Iteration 1

$$x_L = 1.5, x_R = 2.0$$

$$x_m = \frac{1.5 + 2.0}{2} = 1.75$$

$$f(1.75) = 1.75^4 - 13 = 9.97890625 - 13 = -3.62109375$$

$$f(x_m) \cdot f(x_R) = f(1.75) < 0 \quad \therefore x_L = 1.75$$

Iteration 2

$$x_L = 1.75, x_R = 2.0$$

$$x_m = \frac{1.75 + 2.0}{2} = 1.875$$

$$f(1.875) = 1.875^4 - 13 = 12.402587890625 - 13 = -0.597412109375$$

$$f(x_m) \cdot f(x_R) = f(1.875) < 0 \quad \therefore x_L = 1.875$$

Iteration 3

$$x_L = 1.875, x_R = 2.0$$

$$x_m = \frac{1.875 + 2.0}{2} = 1.9375$$

$$f(1.9375) = 1.9375^4 - 13 = 13.968994140625 - 13 = 0.968994140625$$

$$f(x_m) \cdot f(x_R) = f(1.9375) > 0 \quad \therefore x_R = 1.9375$$

Iteration 4

$$x_L = 1.875, x_R = 1.9375$$

$$x_m = \frac{1.875 + 1.9375}{2} = 1.90625$$

$$f(1.90625) = 1.90625^4 - 13 = 12.943123817443848 - 13 = -0.2044123$$

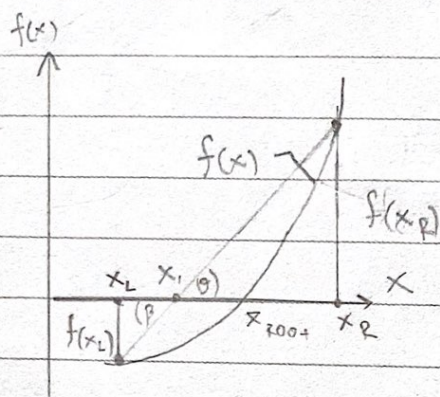
$$f(1.90625) > 0 \quad \therefore x_R = 1.90625$$

คำตอบใน 4 iteration

Ans

$$\therefore \sqrt[4]{13} \approx [1.9375, 1.90625]$$

4. False Position



compute x_1 from $\tan \theta = \tan \beta$

$$\text{Assumption } x_1 = \frac{x_L f(x_R) - x_R f(x_L)}{f(x_R) - f(x_L)}$$

for $f(x_1) = 0$ to

$$\tan \theta = \tan \beta = \frac{x_L f(x_R) - x_R f(x_L)}{f(x_R) - f(x_L)}$$

$$\frac{f(x_R) - f(x_1)}{x_R - x_1} = \frac{f(x_1) - f(x_L)}{x_1 - x_L}$$

$$x_R - x_1 = \frac{x_1 - x_L}{f(x_1) - f(x_L)} \cdot (f(x_R) - f(x_1))$$

$$(x_R - x_1) f(x_1) = (x_1 - x_L) f(x_R)$$

$$x_R f(x_1) - x_1 f(x_1) = x_L f(x_R) - x_1 f(x_L)$$

$$x_1 f(x_R) - x_L f(x_R) = -x_R f(x_L) + x_1 f(x_L)$$

$$x_1 f(x_R) - x_1 f(x_L) = x_L f(x_R) - x_R f(x_L)$$

$$x_1 [f(x_R) - f(x_L)] = x_L f(x_R) - x_R f(x_L)$$

$$x_1 = \frac{x_L f(x_R) - x_R f(x_L)}{f(x_R) - f(x_L)}$$

5.78 False Position method $\sqrt[4]{13}$ interval $[1.5, 2.0]$

5.1 in 4 Iteration

Iteration 1

$$x_1 = \frac{1.5(3) - 2.0(-7.9375)}{3 - (-7.9375)} = 1.862$$

$$f(1.862) = 1.862^4 - 13 = -0.979606$$

$$f(1.862) < 0 \therefore x_L = 1.862$$

Iteration 2

$$x_2 = \frac{1.862(3) - 2.0(-0.979606)}{3 - (-0.979606)} = 1.89597$$

$$f(1.89597) = 1.89597^4 - 13 = -0.0781158$$

$$f(1.89597) < 0 \therefore x_L = 1.89597$$

Iteration 3

$$x_3 = \frac{1.89597(3) - 2.0(-0.0781158)}{3 - (-0.0781158)} = 1.89861$$

$$f(1.89861) = 1.89861^4 - 13 = -0.00599421$$

$$f(1.89861) < 0 \therefore x_L = 1.89861$$

Iteration 4

$$x_4 = \frac{1.89861(3) - 2.0(-0.00599421)}{3 - (-0.00599421)} = 1.89881$$

$$f(1.89881) = 1.89881^4 - 13 = -0.00051818$$

$$f(1.89881) < 0 \therefore x_L = 1.89881$$

Ans $\sqrt[4]{13} \approx [1.89881, 2.0]$