

Utilice el método de Möller con valores iniciales $X_0, X_1, X_2, 4.5, 5.5$ y 5 respectivamente, para determinar la raíz de la ecuación $f(X) = X^3 - 13X - 12$ con 3 cifras significativas.

$$\varepsilon_s = 0.5 \times 10^{2-3} = 0.05\% \quad \text{Iteración 1}$$

$$f(4.5) = (4.5)^3 - 13(4.5) - 12 = 20.625$$

$$f(5.5) = (5.5)^3 - 13(5.5) - 12 = 82.875$$

$$f(5) = (5)^3 - 13(5) - 12 = 48$$

Se determina h_0, h_1

$$h_0 = X_1 - X_0 = 5.5 - 4.5 = 1$$

$$h_1 = X_2 - X_1 = 5 - 5.5 = -0.5$$

Luego, se determina δ_0, δ_1

$$\delta_0 = \frac{f(X_1) - f(X_0)}{h_0} = \frac{82.875 - 20.625}{1} = 62.25$$

$$\delta_1 = \frac{f(X_2) - f(X_1)}{h_1} = \frac{48 - 82.875}{-0.5} = 69.75$$

$$a = \frac{d_1 - d_0}{h_1 + h_0} = \frac{69.75 - 62.25}{-0.5 + 1} = 15$$

$$b = ah_1 + d_1 = 15(-0.5) + 69.75 = 62.25$$

$$C = 48$$

$$D = \sqrt{(62.25)^2 - 4(15)(48)} = 31.54461127$$

Como $|b+D| > |b-D| \Rightarrow$

$$X_r = X_2 + \frac{-2C}{b+D}$$

$$= 5 + \frac{-2(48)}{62.25 + 31.54461127}$$

$$= 3.976487042$$

$$E_a = \left| \frac{3.976487042 - 5}{3.976487042} \right| \cdot 100$$

$$= 25.7391246\% \text{ continua}$$

$$X_0 = 5.5, X_1 = 5, X_2 = 3.976487042$$

$$f(5.5) = 82.875$$

$$f(5) = 69.75$$

$$f(3.976487042) = -0.816332219$$

$$h_0 = -0.5$$

$$h_1 = -1.023512958$$

$$d_0 = 69.75$$

$$d_1 = 68.94522602$$

$$a = 0.528235733$$

$$b = 68.4045699$$

$$c = -0.816332219$$

$$D = 68.41717655$$

Como
 $|D + b| > |D - D|$ entonces.

$$X_r = 3.988419827$$

$$E_{az} = \left| \frac{3.988419827 - 3.976487042}{3.988419827} \right| \times 100$$

$$= 0.299185771\% \quad \text{Continua.}$$

$$X_0 = 5, \quad X_1 = 3.976487042, \quad X_2 = 3.988419827.$$

$$f(5) = 69.75$$

$$f(3.976487042) = -0.816332219$$

$$f(3.988419827) = -0.403698403.$$

$$h_0 = -1.023512958$$

$$h_1 = 0.011932785.$$

$$d_0 = 68.94522602.$$

$$d_1 = 34.57984167.$$

$$a = 33.97198291$$

$$b = 34.98522204$$

$$c = -0.403698403$$

$$D = \sqrt{(34.98522204)^2 - 4(33.97198291)(-0.403698403)}$$

$$= 35.7606418$$

Como $|b+D| > |b-D|$ entonces

$$X_r = 3.988419827 + \frac{-2(-0.403698403)}{34.98522204 + 35.7606418}$$

$$X_r = 3.999832463$$

$$\%a = \left| \frac{3.999832463 - 3.988419827}{3.999832463} \right| \times 100$$

$$\%a = 0.28532785\% \text{ continua.}$$

~~X₀~~ ~~X₁~~

$$X_0 = 3.976487042$$

$$X_1 = 3.988419827$$

$$X_2 = 3.999832463$$

$$f(3.976487042) = -0.816332219$$

$$f(3.988419827) = -0.403698403$$

$$f(3.999832463) = -0.005863458$$

$$h_0 = 0.011932785$$

$$h_1 = 0.011412636$$

$$d_0 = 34.57984167$$

$$d_1 = 34.85916356$$

$$a = 11.96473999$$

$$b = 34.99571278$$

$$c = -0.005863458$$

$$D = \text{~~34~~} 34.99972189$$

Como $|b+D| > |b-D|$ entonces.

$$X = 4.0000000001$$

$$E_a = 0.004188457\% \text{ Defiere.}$$

$$R/R_{\text{air}} = 4.0000000001 \cdot \text{Error} = 0.004188457\%$$