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1) $x^3 - 2x^2 - 5 = 0$ denkleminin $[2,4]$ aralığında kökünü ikiye bölme metodu ile 4 iterasyonda bulunuz.

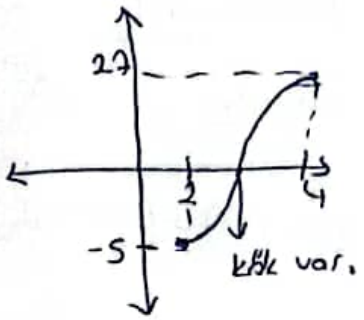
$f(x) = x^3 - 2x^2 - 5 = 0$

(Tanımsız olduğu nokta yok)
Her yerde sürekli

$f(2) = 8 - 8 - 5 = -5 < 0$

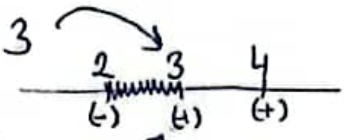
$f(4) = 64 - 32 - 5 = 27 > 0$

$f(2) \cdot f(4) < 0$



1. İterasyon:

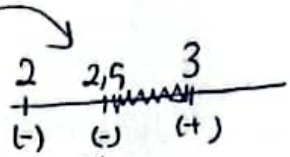
$\frac{4+2}{2} = 3$



$f(3) = 4$ (+)

2. İterasyon:

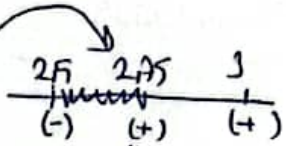
$\frac{3+2}{2} = 2,5$



$f(2,5) = -1,875$

3. İterasyon:

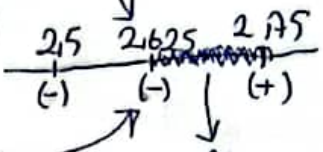
$\frac{2,5+3}{2} = 2,75$



$f(2,75) = 0,671875$

4. İterasyon:

$\frac{2,5+2,75}{2} = 2,625$



$f(2,625) = -0,693$

Hesaplanan kökün = 2,625 yaklaşık değeri

Bir sonraki adımda bakılacak aralık

2) $x^3 + 4x^2 - 10 = 0$ denkleminin $[1,2]$ aralığında kökünü ikiye bölme metoduyla 4 iterasyon sonucunda bulunuz.

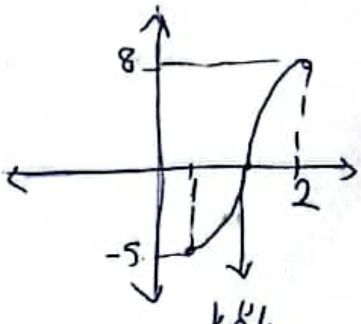
$f(x) = x^3 + 4x^2 - 10 = 0$

(Tanımsız olduğu nokta yok)
Her yerde sürekli

$f(1) = 1 + 4 - 10 = -5 < 0$

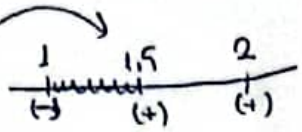
$f(2) = 8 + 16 - 10 = 8 > 0$

$f(1), f(2) < 0$



1. iterasyon:

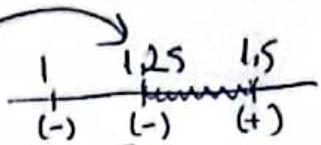
$\frac{2+1}{2} = 1,5$



$f(1,5) = 2,375$

2. iterasyon:

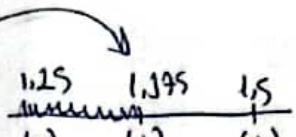
$\frac{1,5+1}{2} = 1,25$



$f(0,129) = -1,796$

3. iterasyon:

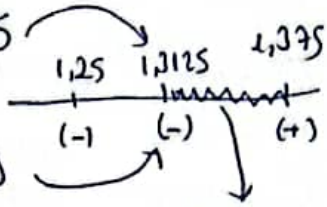
$\frac{1,25+1,5}{2} = 1,375$



$f(1,375) = 0,16210$

4. iterasyon:

$\frac{1,25+1,375}{2} = 1,3125$



$f(1,3125) = -0,8483$

Bir sonraki adımda bakılacak aralık

Hesaplanan kökün yaklaşık değeri = 1,3125 //

1) $f(x) = x^{1/3}$ denkleminin kökünü bulmak için Newton-Raphson yöntemini kullanınız.

$x_0 = 8$ alsun $\quad f'(x) = \frac{1}{3} x^{-\frac{2}{3}}$

$n=0 \quad x_1 = x_0 - \frac{f(x_0)}{f'(x_0)} = 8 - \frac{8^{1/3}}{\frac{1}{3} \cdot 8^{-\frac{2}{3}}} \cong 0,10055$

$n=1 \quad x_2 = x_1 - \frac{f(x_1)}{f'(x_1)} = 0,10055 - \frac{(0,10055)^{1/3}}{\frac{1}{3} \cdot (0,10055)^{-\frac{2}{3}}} \cong 0,0603$

$n=2 \quad x_3 = x_2 - \frac{f(x_2)}{f'(x_2)} = 0,0603 - \frac{(0,0603)^{1/3}}{\frac{1}{3} \cdot (0,0603)^{-\frac{2}{3}}} \cong -0,1498$

Kökün yaklaşık değeri = -0,1498 //

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2) $f(x) = 4e^{-0,5x} - x$ denkleminin kökünü Newton-Raphson ile başlangıç değerini $x_0 = 2$ alarak 4 iterasyon sonucunda bulun.

$f'(x) = -2e^{-0,5x} - 1$

$n=0 \quad x_1 = x_0 - \frac{f(x_0)}{f'(x_0)} = 2 - \frac{(4.e^{-0,5.2} - 2)}{(-2.e^{-0,5.2} - 1)} \cong 1,696$

$n=1 \quad x_2 = x_1 - \frac{f(x_1)}{f'(x_1)} = 1,696 - \frac{(4.e^{-0,5.1,696} - 1,696)}{(-2.e^{-0,5.1,696} - 1)} \cong 1,2241$

$n=2 \quad x_3 = x_2 - \frac{f(x_2)}{f'(x_2)} = 1,2241 - \frac{(4.e^{-0,5.1,2241} - 1,2241)}{(-2.e^{-0,5.1,2241} - 1)} \cong -0,9611$

$n=3 \quad x_4 = x_3 - \frac{f(x_3)}{f'(x_3)} = -0,961 - \frac{(4e^{-0,5.-0,961} + 0,961)}{(-2e^{-0,5.0,961} - 1)} \cong -0,485$

Kökün yaklaşık değeri = $-0,485$ //