KMU236 SAYISAL YÖNTEMLER [1-6]

Kaynaklar:

1. Chapra S.C. and Canale R.P. "Numerical Methods for Engineers", Sixth Edition,McGraw Hill, International Edition 2010.

2. Chapra S.C. and Canale R. P. "Yazılım ve programlama Uygulamalarıyla Mühendisler için Sayısal Yöntemler" 4.Basımdan Çevirenler: Hasan Heperkan ve Uğur Kesgin 2003.

3.Chapra S.C. "Applied Numerical Methods with MATLAB for engineers and Scientists" Third Edition, McGraw Hill, International Edition 2012.

4. Mathews J.H. and Fınk K.D. "Numerical Methods using MATLAB", Fourth Edition, Pearson P. Hall, International Edition 2004.

5. Fausett L.V. "Applied Numerical Analysis Using MATLAB, Second Edition, PearsonP. Hall, International Edition, 2008.

6. Gilat A. And Subramaniam V. "Numerical Methods, An introduction with Applications Using MATLAB", Second Edition,John Wiley and Sons. Inc. 2011.

Genel Olarak Sayısal Yöntemler

- **Programlama**

fzero, polyder, deconv, polyval, conv, roots

0 ve 1 ilk tahmin alınarak işlevin köklerini bulmak

$$f(x) = e^{-x} - x$$

```
>> x0=[0  1];
        >> x=fzero(@(x) exp(-x)-x, x0)
             or
        >> x=fzero('exp(-x)-x',x0)
```

aşağıda verilen fonksiyonu x = 2,5 değerinde değerlendirmek

f(x)=x^2-2.71x+5

```
>> a=[1   -2.71   5];
  >> polyval(a,2.5)
```

, g(f), **fonksiyonunun köklerini bulmak için**

0.08 ilk tahminiyle

$$g(f) = \frac{1}{\sqrt{f}} + 2.0\,log\left(\frac{\varepsilon}{3.7 * D} + \frac{2.51}{Re\sqrt{f}}\right)$$

veri:

ε=0.0015/1000 ρ=1.23 v=40 D=0.005 μ=1.79*〖10〗^(-5)

Re=(ρ*V*D)/μ

```
>> rho=1.23; mu=1.79e-5; D=0.005; v=40; e=0.0015/1000;
  >> Re=rho*v*D/mu;
  >> g=@(f) 1/sqrt(f)+2*log10(e/(3.7*D)+2.51/(Re*sqrt(f));
  >> fzero(g,0.08)
```

MATLAB, aşağıda verilen lineer cebirsel denklem setini çözme komutları

$$5x_1 - 0.2x_2 - 0.8x_3 = 4.86$$
$$0.2x_1 + 9x_2 - 0.9x_3 = -58.02$$
$$0.4x_1 - 0.3x_2 + 12x_3 = 60$$

```
>> A=[5  -0.2  -0.8;0.2  9  -0.9;  0.4  -0.3  12];
>> B=[4.86; -58.02; 60];
>> x=A\B
 or
>> x=inv(A)*B
```

$[A]^{-1}$. bulmak için MATLAB Komutları

$$A = \begin{bmatrix} 4 & 2.6 & -0.9 \\ 0.5 & 1 & 5.2 \\ 7 & -3 & -8 \end{bmatrix}$$

- mutlak yaklaşık bağıl hata ,εa

$$v=\frac{g*m}{c}\left(1-e^{-\left(\frac{c}{m}\right)*t}\right)$$

$$v-v=\frac{g*m}{c}\left(1-e^{-\left(\frac{c}{m}\right)*t}\right)-v$$

$$f(c)=\frac{g*m}{c}\left(1-e^{-\left(\frac{c}{m}\right)*t}\right)-v=\frac{9.81*75}{c}\left(1-e^{-\left(\frac{c}{75}\right)*6}\right)-48$$

$$f(c)=\frac{735.75}{c}\left(1-e^{-0.08*c}\right)-48$$

Kök xr 'nin başlangıç tahmini

$$x_r=\frac{4+8}{2}=6$$

fonksiyon değerinin sonucunun alt sınırda ve orta noktada hesaplanması:

f(4)*f(6)=(2.3715)*(-1.2533)=-2.9722

$x_L = 4, \qquad x_r = x_U = 6$

$x_r = \frac{4+6}{2} = 5$

$\varepsilon_a = \left|\frac{5-6}{5}\right| 100\% = 20$

$f(4) * f(5) = (2.3715) * (0.5124) = 1.2152 > 0$

$x_r = x_L = 5, \qquad x_U = 6$

$x_r = \frac{5+6}{2} = 5.5$

$\varepsilon_a = \left|\frac{5.5-5}{5.5}\right| 100\% = 9.09$

$f(5) * f(5.5) = (0.5124) * (-0.3818) = -0.1956 < 0$

$x_L = 5, \qquad x_r = x_U = 5.5$

$x_r = \frac{5+5.5}{2} = 5.25$

$\varepsilon_a = \left|\frac{5.25-5.5}{5.25}\right| 100\% = 4.76$

$f(5) * f(5.25) = (0.5124) * (0.0624) = 0.032 > 0$

$x_r = x_L = 5.25, \qquad x_U = 5.5$

$x_r = \frac{5.25+5.5}{2} = 5.375$

$\varepsilon_a = \left|\frac{5.375-5.25}{5.375}\right| 100\% = 2.33$

iterasyon	x_L	x_U	x_r	$(\%)\varepsilon_a$
1	4	8	6	
2	4	6	5	20
3	5	6	5.5	9.09
4	5	5.5	5.25	4.76
5	5.25	5.5	5.375	2.33

x = 5.375

$$x_{i+1} = x_i - \frac{f(x_i)}{f'(x_i)}$$

$$f(x) = x^3 - 8.10x^2 - 9.35x + 21.41$$

$$f'(x) = 3x^2 - 16.2x - 9.35$$

$$x_{i+1} = x_i - \frac{x_i^3 - 8.10x_i^2 - 9.35x_i + 21.41}{3x_i^2 - 16.2x_i - 9.35}$$

iterasyon	x_i	$(\%)\varepsilon_a$
1	9.50	
2	8.9518	[(8.9518 – 9.50) / 8.9518] 100% = 6.13
3	8.8824	[(8.8824 – 8.9518) / 8.8824] 100% = 0.78
4	8.8813	[(8.8813 – 8.8824) / 8.8813] 100% = 0.012

x = 8.8813