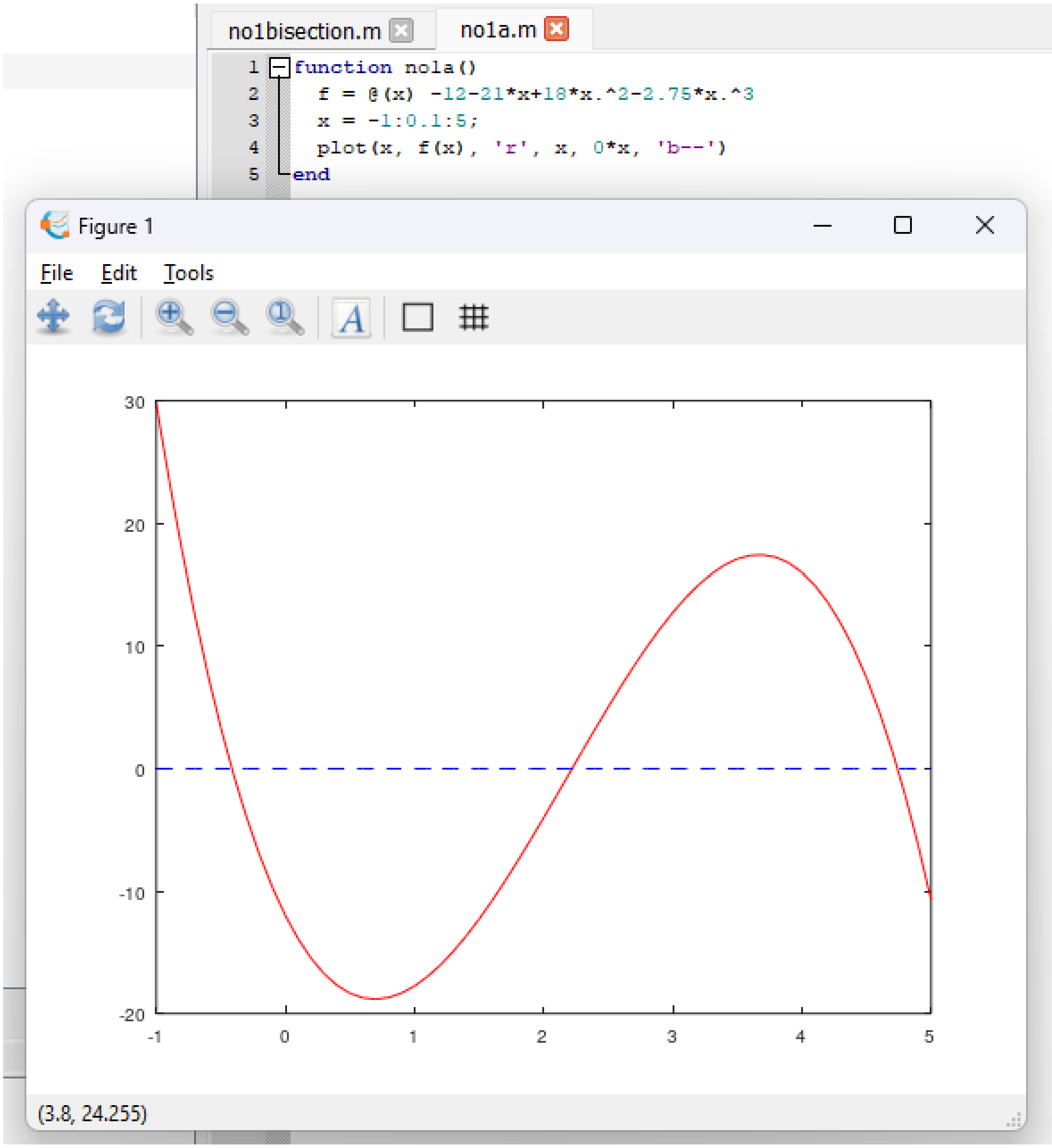
C14210026 - james berlin tungka
No 1

A. Graphic:



B. Cara:

a. Bisection

Perhitungan manual:

No
Date

No 1 b . Bisection Method

iter 1 $f(x) = -12 - 21x + 18x^2 - 2.75x^3$

$x_l = -1$

$x_u = 0$

$x_t = -0.5$

$f(x_l) = f(-1) = -12 - 21(-1) + 18(-1)^2 - 2.75(-1)^3 = 29.75$

$f(x_u) = f(0) = -12 - 21(0) + 18(0)^2 - 2.75(0)^3 = -12$

$f(x_t) = f(-0.5) = -12 - 21(-0.5) + 18(-0.5)^2 - 2.75(-0.5)^3 = 3.34375$

antara x_u dan x_t $[-0.5, 0]$

iter 2

$x_l = -0.5$

$x_u = 0$

$x_t = -0.25$

$f(x_l) = f(-0.5) = -12 - 21(-0.5) + 18(-0.5)^2 - 2.75(-0.5)^3 = 3.34375$

$f(x_u) = f(0) = -12 - 21(0) + 18(0)^2 - 2.75(0)^3 = -12$

$f(x_t) = f(-0.25) = -12 - 21(-0.25) + 18(-0.25)^2 - 2.75(-0.25)^3 = -5.582$

antara x_l dan x_t

iter 3

$x_l = -0.5$

$x_u = -0.25$

$x_t = -0.375$

$f(x_l) = f(-0.5) = -12 - 21(-0.5) + 18(-0.5)^2 - 2.75(-0.5)^3 = 3.34375$

$f(x_u) = f(-0.25) = -12 - 21(-0.25) + 18(-0.25)^2 - 2.75(-0.25)^3 = -5.5820$

$f(x_t) = f(-0.375) = -12 - 21(-0.375) + 18(-0.375)^2 - 2.75(-0.375)^3 = -1.44873$

antara x_l dan x_t

iter 4 $x_l = -0.5$

$x_u = -0.375$

$x_t = -0.4375$

$f(x_l) = f(-0.5) = -12 - 21(-0.5) + 18(-0.5)^2 - 2.75(-0.5)^2 = 3.34375$

$f(x_u) = f(-0.375) = -12 - 21(-0.375) + 18(-0.375)^2 - 2.75(-0.375)^2 = -1.44873$

$f(x_t) = f(-0.4375) = -12 - 21(-0.4375) + 18(-0.4375)^2 - 2.75(-0.4375)^2 = 0.86309$

KENKO® 36 Lines, 6 mm

antara x_u dan x_t

No 1b

iter 1 real root = -0.414689

ε_t (%) = $|((-0.414689 - x_r)/(-0.414689)| * 100$ = 20.5722%

ε_a (%) = -

iter 2

ε_a (%) = $|(x_r - x_{r_{i-1}})/(x_r)| * 100$ = 100 %

ε_t (%) = 39.71385 %

iter 3

ε_a (%) = 33.3333 %

ε_t (% = 9.5707 %

iter 4

ε_a (%) = 14.28571 %

ε_t (%) = 5,5007 %

Penjelasan:

1. Cari x average dari xl dan xu
2. Masukkan hasil x average,xl ,dan xu ke dalam fungsi
3. Apabila hasil perkalian antara xaverage dengan xl atau xu negatif berarti berada hasil x berada di antara itu, ubah xl atau xu sesuai dengan tempat berada
4. Untuk Et = | (akar asli - Xt) / akar asli |
5. Untuk Ea = | (Xr_i - Xr_{i-1})/(Xr) | tetapi hanya bisa dimulai pada iterasi pertama (di gambar iter 2)

Program:

```
function nolbisection()
  fm = @(x) (-12-21*x+18*x*x-2.75*x*x*x);
  [x fx ea iter] = bisect(@(x) fm(x),-1,0,1,4)
end

function [root,fx,ea,iter]=bisect(func,xl,xu,es,maxit,varargin)
  if nargin<3,error('at least 3 input arguments required'),end
  test = func(xl,varargin{:})*func(xu,varargin{:});
  if test>0,error('no sign change'),end
  if nargin<4
    isempty(es)
    es=1.0;
  end
  if nargin<5
    isempty(maxit)
    maxit=4;
  end

  iter = 0; xr = xl; ea = 100;
    while (1)
     xrold = xr;
     xr = (xl + xu)/2;
     iter = iter + 1;
     if xr ~= 0,ea = abs((xr-xrold)/xr)*100;end
     test = func(xl,varargin{:})*func(xr,varargin{:});
     if test < 0
     xu = xr;
     elseif test > 0
     xl = xr;
     else
     ea = 0;
     end
     if ea <= es | iter >= maxit,break,end
    end
  root = xr; fx = func(xr, varargin{:});
end
```

Hasil:

```
>> nolbisection
x = -0.4375
fx = 0.8631
ea = 14.286
iter = 4
```

b. False Position

No 1 c False Position $f(x) = -2-21x+18x^2-2.75x^3$

$x_r = x_u - \frac{f(x_u)(x_l - x_u)}{(f(x_l)-f(x_u))}$

iter 1

$x_l = -1$

$x_u = 0$

$f(x_l) = -12-21(-1)+18(-1)^2-2.75(-1)^3 = 29.75$

$f(x_u) = -12-21(0)+18(0)^2-2.75(0)^3 = -12$

$x_r = 0-((-12)(-1-0))/(29.75-12) = -0.287425$

$f(x_r) = -4.41173$

antara x_l dan x_r [-1, -0.287425]

iter 2

$x_l = -1$

$x_u = -0.287425$

$f(x_l) = 29.75$

$f(x_u) = -4.41173$

$x_r = -0.379448$

$f(x_r) = -1.289665$

antara x_l dan x_r [-1, -0.379448]

iter 3

$x_l = -1$

$x_u = -0.379448$

$f(x_l) = 29.75$

$f(x_u) = -1.28969$

$x_r = -0.405231$

$f(x_r) = -0.391302$

antara x_l dar x_r [-1, -0.405231]

iter 4

$x_l = -1$

$x_u = -0.405231$

$f(x_l) = 29.75$

$f(x_u) = -0.391334$

$x_r = -0.412172$

$f(x_r) = -0.09384$

antara x_L dan x_r [-1, -0.412172]

No 1c

iter 1

ε_a = –

ε_t = 30.688,98%

iter 2

ε_a = 24.2519 %

ε_t = 8.4979%

iter 3

ε_a = 6.3625%

ε_t = 2.2805%

iter 4

ε_a = 1.6840 %

ε_t = 0.6067%

Penjelasan:

1. Set Xl dan Xu
2. Hitung f(Xl) dan f(Xu)
3. Hitung Xr
    a. Xr = Xu - (f(Xu)(Xl-Xu) / (f(Xl)-f(Xu))
4. Hitung f(Xr)

5. Kalikan hasil f(Xr) dengan f(Xl) dan f(Xu) yang hasilnya negatif menandakan bahwa hasil asli berada di antara Xr dengan Xl atau Xu kemudian ubah Xl dan Xu menjadi Xr dengan Xl atau Xu
6. Untuk Et = | (akar asli - Xt) / akar asli |
7. Untuk Ea = | (Xr_i - Xr_{i-1})/(Xr) | tetapi hanya bisa dimulai pada iterasi pertama (di gambar iter 2)

Program:

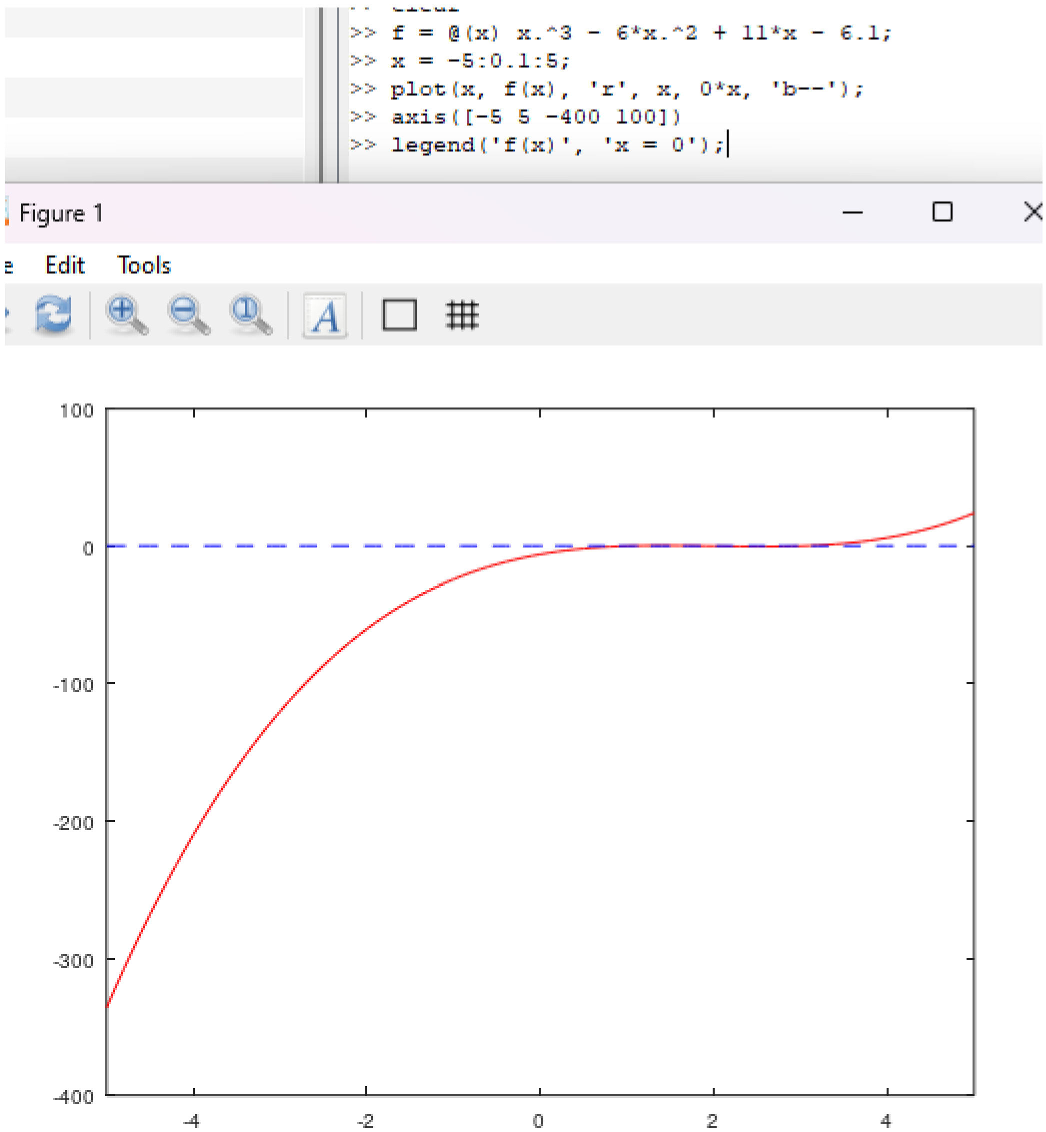
```
function nolFalsePosition()
  f = @(x) (-12-21*x+18*x*x-2.75*x*x*x);
  xl = -1;
  xu = 0;
  es = 1;
  xm=xl;
  xmi=0;
  f(xl)
  while (abs((xmi-xm)/xmi)*100>e)
     xmi=xm;
     xm=xu-(f(xu)*(xl-xu))/(f(xl)-f(xu));
      if f(xm)*f(xl)<0
          xu=xm;
      else
          xl=xm;
      end
    xmi
  end

  Root=xm
end
```

Hasil:

```
>> nolFalsePosition
ans = 29.750
xmi = -1
xmi = -0.2874
xmi = -0.3794
xmi = -0.4052
Root = -0.4122
>>
```

No 2

A. Graphic



B. Newton Raphson

No
Date

Newton Raphson

$f(x) = x^3 - 6x^2 + 11x - 6.1$

$f'(x) = 3x^2 - 12x + 11$

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

iter 0

$x = 3.5$

$f(x) = (3.5)^3 - 6(3.5)^2 + 11(3.5) - 6.1$

$= 42.875 - 6 \times (12.25) + 38.5 - 6.1$

$= 1.775$

$f'(x) = 3(3.5)^2 - 12(3.5) + 11$

$= 3(12.25) - 42 + 11$

$= 5.75$

$x_{i+1} = 3.5 - (1.775/5.75)$

$= 3.5 - 0.30869$

$= 3.1913$

$e_a = |((3.1913) - (3.5))/3.1913| * 100 = 9.673\ \%$

iter 1

$x = 3.1913$

$f(x) = (3.1913)^3 - 6(3.1913)^2 + 11(3.1913) - 6.1$

$= 32.5014 - 6(10.1844) + 35.1043 - 6.1$

$= 0.3994$

$f'(x) = 3(3.1913)^2 - 12(3.1913) + 11$

$= 3(10.1844) - 38.2956 + 11$

$= 3.2576$

$x_{i+1} = 3.1913 - (0.3994/3.2576)$

$= 3.1913 - 0.1226$

$= 3.0686$

$e_a = |(3.0686 - 3.1913)/3.0686| * 100 = 3.9554\ \%$

No
Date

iter 2

$x = 3.0686$

$f(x) = (3.0686)^3 - 6(3.0686)^2 + 11(3.0686) - 6.1$

$= 0.0518$

$f'(x) = 3(3.0686)^2 - 12(3.0686) + 11$

$= 2.4263$

$x_{i+1} = 3.0686 - \left(\frac{0.0518}{2.4263}\right) = 3.0473$

$e_a = \left|\frac{(3.0473 - 3.0686)}{3.0473}\right| * 100 = 0.7016\%$

iter 3

$x = 3.047$

$f(x) = (3.047)^3 - 6(3.047)^2 + 11(3.047) - 6.1$

$= 0.001456$

$f'(x) = 3(3.047)^2 - 12(3.047) + 11$

$= 2.29061$

$x_{i+1} = 3.047 - \left(\frac{0.001456}{2.29061}\right) = 3.04668$

$e_a = 0.02086$

C. Secand Method

Secant Method

$f(x) = x^3 - 6x^2 + 11x - 6.1$

iter -1

$x_i = 2.5$

$f(x_i) = (2.5)^3 - 6(2.5)^2 + 11(2.5) - 6.1$

$= -0.475$

iter 0

$x_i = 3.5$

$f(x_i) = (3.5)^3 - 6(3.5)^2 + 11(3.5) - 6.1$

$= 1.775$

$x_{i+1} = 3.5 - \frac{1.775(2.5-3.5)}{-0.475-1.775} = 2.7111$

iter 1

$x_i = 2.7111$

$f(x_i) = -0.4515$

$\varepsilon_t = |2.7111 - 3.5| * 100 = 78.889\%$

$\varepsilon_a = |(2.711 - 3.5)/(2.711)| * 100 = 29.0983$

$x_{i+1} = 2.87109$

iter 2

$x_i = 2.87109$

$f(x_i) = -0.3101$

$\varepsilon_t = 0.1599$

$\varepsilon_a = 5.5720$

$x_{i+1} = 3.2219$

iter 3

$x_i = 3.2219$

$f(x_i) = 0.50252$

$\varepsilon_t = 37.08329$

$\varepsilon_a = 10.8889$

$x_{i+1} = 3.06497$

D. Modified Secant Method

Modified Secant Method

$f(x) = x^3 - 6x^2 + 11x - 6.1$

$\delta = 0.01$

iter 0

$x_i = 3.5$

$x_i + x_i\delta = 3.535$

$f(x_i) = (3.5)^3 - 6(3.5)^2 + 11(3.5) - 6.1 = 1.775$

$f(x_i + x_i\delta) = (3.535)^3 - 6(3.535)^2 + 11(3.535) - 6.1 = 1.9818$

$x_{i+1} = 3.5 - \dfrac{\delta * 3.5 * 1.775}{(1.9818 - 1.775)} = 3.1995$

iter 1

$x_i = 3.1995$

$x_i + x_i\delta = 3.23159$

$f(x_i) = 0.42661$

$f(x_i + x_i\delta) = 0.53651$

$\varepsilon_t = |3.1995 - 3.5| * 100 = 30.0403$

$\varepsilon_a = |(3.1995 - 3.5)/3.1995| * 100 = 9.3887$

$x_{i+1} = 3.0753$

iter 2

$x_i = 3.0753$

$x_i + x_i\delta = 3.10607$

$f(x_i) = 0.06809$

$f(x_i + x_i\delta) = 0.14710$

$\varepsilon_t = 12.42728$

$\varepsilon_a = 4.04096$

$x_{i+1} = 3.04881$

iter 3

$x_i = 3.04881$

$x_i + x_i\delta = 3.0793$

$f(x_i) = 0.0049$

$f(x_i + x_i\delta) = 0.07798$

$\varepsilon_t = 2.6505$

$\varepsilon_a = 0.86937$

$x_{i+1} = 3.04677$

E. Berdasarkan MATLAB

```
iter = 4
>> no2e
   3.0467
   1.8990
   1.0544
>>
```