Exercici 2 - Teoria
dimarts 13 de març 2018

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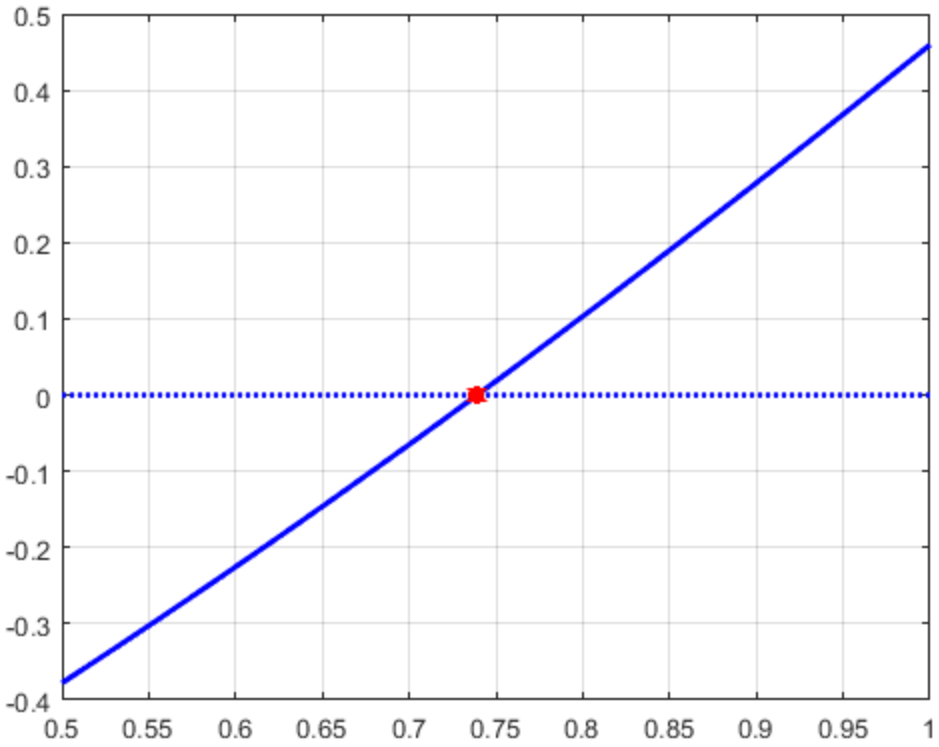
```
clc, clear all, format long
```

Gràfica

```
t=0.5:0.01:1;
f=@(x)x-cos(x);
figure(1)
alpha = fzero(f,1)
plot(t,f(t),'b',t,zeros(size(t)),'b:',alpha,0,'r*','LineWidth',2),grid
```

```
alpha =
   0.739085133215161
```



Mètode de Newton

```
f=@(x)x-cos(x);
df=@(x)1+sin(x);
a=0.5; tol = 0.00005;
[ xnw ] = newton( f,df,a,tol );

iteration |     xns    |     f(xns)  |   error rel
-------------------------------------------------------------------------------
    0  |    0.50000  |   -0.37758  |    0.00000
    1  |    0.75522  |    0.02710  |    0.33794
    2  |    0.73914  |    0.00009  |    0.02176
    3  |    0.73909  |    0.00000  |    0.00008
    4  |    0.73909  |    0.00000  |    0.00000
-------------------------------------------------------------------------------
final solution:
 x = 0.7390851332
time elapsed in milliseconds:
 t = 3.8297481249
```

Mètodes de la iteració simple

Mètode 1. x=(x+cos(x))/2

```
a=0; b=1; tol = 0.0000000005;
```

```
g1=@(x)(x+cos(x))/2; dg1=@(x)(1-sin(x))/2;
if abs(dg1(a)) < 1
    [ xi ] = fixedpt( f, g1, a, b, tol );
else
    fprintf('\nMètode divergent\n')
end
fprintf('\n\n')
```

```
iteration |     xns    |     f(xns)  |   error rel
-------------------------------------------------------------------------------
    0  | 0.00000000  | -1.00000000  | 1.00000000
    1  | 0.50000000  | -0.37758256  | 1.00000000
    2  | 0.68879128  | -0.08322357  | 0.27409070
    3  | 0.73040306  | -0.01450249  | 0.05697099
    4  | 0.73765431  | -0.00239389  | 0.00983014
    5  | 0.73885125  | -0.00039141  | 0.00162001
    6  | 0.73904696  | -0.00006389  | 0.00026480
    7  | 0.73907890  | -0.00001043  | 0.00004323
    8  | 0.73908412  | -0.00000170  | 0.00000705
    9  | 0.73908497  | -0.00000028  | 0.00000115
   10  | 0.73908511  | -0.00000005  | 0.00000019
   11  | 0.73908513  | -0.00000001  | 0.00000003
   12  | 0.73908513  | -0.00000000  | 0.00000001
   13  | 0.73908513  | -0.00000000  | 0.00000000
   14  | 0.73908513  | -0.00000000  | 0.00000000
-------------------------------------------------------------------------------
final solution:
 x = 0.7390851332
time elapsed in milliseconds:
 t = 5.2993189123
```

Mètode 2. x=(2x+cos(x))/3

```
a=0; b=1; tol = 0.0000000005;
g2=@(x)(2*x+cos(x))/3; dg2=@(x)(2-sin(x))/3;
if abs(dg2(a)) < 1
    [ xi ] = fixedpt( f, g2, a, b, tol );
else
    fprintf('\nMètode divergent\n')
end
fprintf('\n\n')
```

```
iteration |     xns    |     f(xns)  |   error rel
-------------------------------------------------------------------------------
    0  | 0.00000000  | -1.00000000  | 1.00000000
    1  | 0.33333333  | -0.61162361  | 1.00000000
    2  | 0.53720787  | -0.32193300  | 0.37950773
    3  | 0.64451887  | -0.15487006  | 0.16649784
    4  | 0.69614222  | -0.07117951  | 0.07415633
    5  | 0.71986873  | -0.03202355  | 0.03295949
    6  | 0.73054325  | -0.01426877  | 0.01461175
    7  | 0.73529950  | -0.00633037  | 0.00646846
```

```
    8  | 0.73740963  | -0.00280311  | 0.00286154
    9  | 0.73834400  | -0.00124017  | 0.00126549
   10  | 0.73875739  | -0.00054848  | 0.00055958
   11  | 0.73894021  | -0.00024253  | 0.00024742
   12  | 0.73902106  | -0.00010724  | 0.00010939
   13  | 0.73905680  | -0.00004741  | 0.00004837
   14  | 0.73907261  | -0.00002096  | 0.00002138
   15  | 0.73907960  | -0.00000927  | 0.00000945
   16  | 0.73908268  | -0.00000410  | 0.00000418
-------------------------------------------------------------------------------
final solution:
 x = 0.7390826847
time elapsed in milliseconds:
 t = 0.8327567795
```

Mètode 3. x=x-cos(x)

```
a=1; b=0.6; tol = 0.0000000005;
g3=@(x)cos(x); dg3=@(x)sin(x);
if abs(dg3(a)) < 1
    [ xi ] = fixedpt( f, g3, a, b, tol );
else
    fprintf('\nMètode divergent\n')
end
fprintf('\n\n')
```

```
iteration |     xns    |     f(xns)  |   error rel
-------------------------------------------------------------------------------
    0  | 1.00000000  | 0.45969769  | 0.66666667
    1  | 0.54030231  | -0.31725091  | 0.85081572
    2  | 0.85755322  | 0.20326343  | 0.36994895
    3  | 0.65428979  | -0.13919057  | 0.31066269
    4  | 0.79348036  | 0.09211159  | 0.17541779
    5  | 0.70136877  | -0.06259091  | 0.13133117
    6  | 0.76395968  | 0.04185726  | 0.08192960
    7  | 0.72210243  | -0.02831534  | 0.05796582
    8  | 0.75041776  | 0.01901372  | 0.03773276
    9  | 0.73140404  | -0.01283331  | 0.02599619
   10  | 0.74423735  | 0.00863261  | 0.01724357
   11  | 0.73560474  | -0.00582035  | 0.01173540
   12  | 0.74142509  | 0.00391820  | 0.00785021
   13  | 0.73750689  | -0.00264045  | 0.00531276
   14  | 0.74014734  | 0.00177813  | 0.00356746
   15  | 0.73836920  | -0.00119800  | 0.00240819
   16  | 0.73956720  | 0.00080688  | 0.00161986
-------------------------------------------------------------------------------
final solution:
 x = 0.7395672022
time elapsed in milliseconds:
 t = 0.5645017945
```

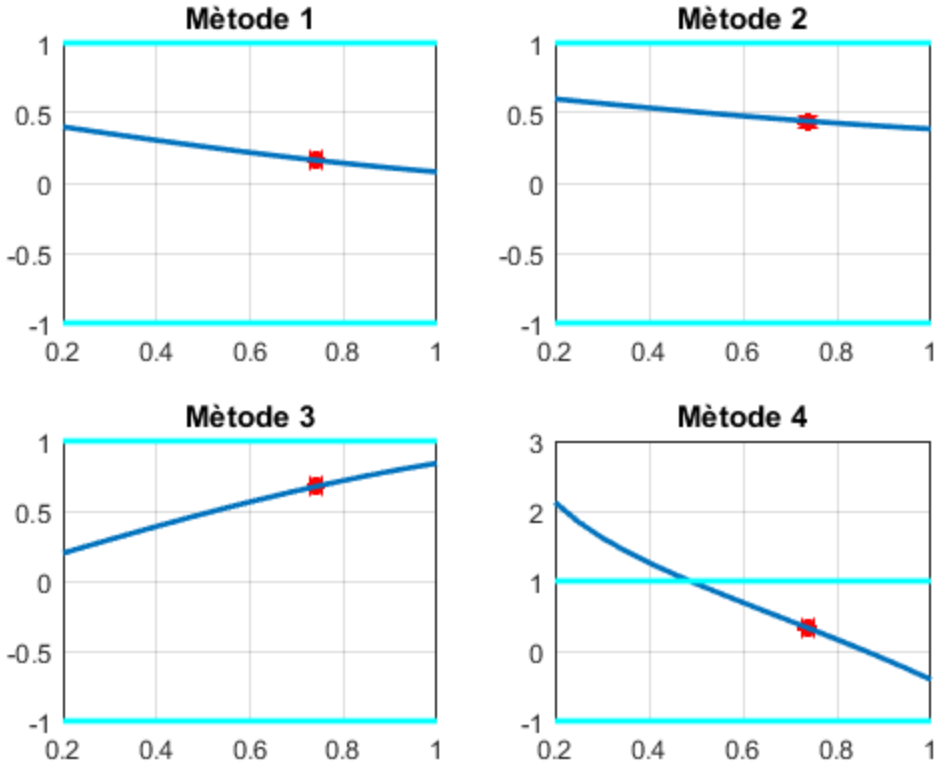
Mètode 4. x=sqrt(x*cos(x))

```
a=0.2; b=0.4;
%a=0.6; b=0.8;
ol = 0.0000000005;
g4=@(x)sqrt(x*cos(x));
dg4=@(x)(cos(x)-x.*sin(x))./(sqrt(x.*cos(x)));
if abs(dg4(a)) < 1
    [ xi ] = fixedpt( f, g4, a, b, tol );
else
    fprintf('\nMètode divergent\n')
end
fprintf('\n\n')
```

Mètode divergent

Estudi convergència

```
t=0.2:0.05:1;
figure(2)
subplot(2,2,1),plot(alpha,dg1(alpha),'r*',t,-
ones(size(t)),'c',t,dg1(t),t,ones(size(t)),'c','LineWidth',2),grid,title('Mètode
 1')
subplot(2,2,2),plot(alpha,dg2(alpha),'r*',t,-
ones(size(t)),'c',t,dg2(t),t,ones(size(t)),'c','LineWidth',2),grid,title('Mètode
 2')
subplot(2,2,3),plot(alpha,dg3(alpha),'r*',t,-
ones(size(t)),'c',t,dg3(t),t,ones(size(t)),'c','LineWidth',2),grid,title('Mètode
 3')
subplot(2,2,4),plot(alpha,dg4(alpha),'r*',t,-
ones(size(t)),'c',t,dg4(t),t,ones(size(t)),'c','LineWidth',2),grid,title('Mètode
 4')
```



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