Punto fijo

Ejemplo

```
clear all
syms c;
f=exp(-c);
xr(1)=double(subs(f,c,0));
iter(1) = 1;
imax = 10;
es=0.5;
ea(1)=100;
i = 1;
while abs(ea(i)) >= es && i < imax
    xr(i+1) = double(subs(f,c,xr(i)));
    iter(i+1) = i + 1;
    if xr ~= 0
        ea(i+1) = abs((xr(i+1)-xr(i))/xr(i+1))*100;
    end
    i = i + 1;
end
 table(iter',xr',ea','VariableNames',{'I','Xr','Ea'})
```

ans = 10×3 table

	I	Xr	Ea
1	1	1.0000	100.0000
2	2	0.3679	171.8282
3	3	0.6922	46.8536
4	4	0.5005	38.3091
5	5	0.6062	17.4468
6	6	0.5454	11.1566
7	7	0.5796	5.9034
8	8	0.5601	3.4809
9	9	0.5711	1.9308
10	10	0.5649	1.1089

Ejercicios:

1. Usar el método de iteración del punto fijo para aproximar la raíz de $f(x)=\cos x - x$, comenzando con $x_0=0$ y hasta que $\varepsilon_a \leq 1\%$.

```
clear all
syms c;
f=cos(c);
```

```
xr(1)=double(subs(f,c,0));
iter(1) = 1;
imax = 30;
es=1;
ea(1)=100;
i = 1;
while abs(ea(i)) >= es && i < imax
    xr(i+1) = double(subs(f,c,xr(i)));
    iter(i+1) = i + 1;
    if xr ~= 0
        ea(i+1) = abs((xr(i+1)-xr(i))/xr(i+1))*100;
    end
    i = i + 1;
end
 table(iter',xr',ea','VariableNames',{'I','Xr','Ea'})
```

	I	Xr	Ea
1	1	1.0000	100.0000
2	2	0.5403	85.0816
3	3	0.8576	36.9949
4	4	0.6543	31.0663
5	5	0.7935	17.5418
6	6	0.7014	13.1331
7	7	0.7640	8.1930
8	8	0.7221	5.7966
9	9	0.7504	3.7733
10	10	0.7314	2.5996
11	11	0.7442	1.7244
12	12	0.7356	1.1735
13	13	0.7414	0.7850

2. Utilice la iteración simple de punto fijo para localizar la raíz de $f(x)=sen(\sqrt{x_i})-x$, $x_0=0.5$, e itere hasta que $\varepsilon_a \leq 0.001\%$. Compruebe que el proceso converge en forma lineal.

```
clear all
syms c;
f=sin(sqrt(c));
xr(1)=double(subs(f,c,0.5));
iter(1) = 1;
imax = 30;
es=0.001;
ea(1)=100;
i = 1;
```

```
while abs(ea(i)) >= es && i < imax
    xr(i+1) = double(subs(f,c,xr(i)));
    iter(i+1) = i + 1;
    if xr ~= 0
        ea(i+1) = abs((xr(i+1)-xr(i))/xr(i+1))*100;
    end
    i = i + 1;
end
 table(iter',xr',ea','VariableNames',{'I','Xr','Ea'})
```

	I	Xr	Ea
1	1	0.6496	100.0000
2	2	0.7215	9.9632
3	3	0.7509	3.9123
4	4	0.7621	1.4691
5	5	0.7662	0.5418
6	6	0.7678	0.1984
7	7	0.7683	0.0725
8	8	0.7685	0.0265
9	9	0.7686	0.0097
10	10	0.7686	0.0035
11	11	0.7686	0.0013
12	12	0.7686	0.0005