Rezolvare examen 1

```
clear
syms x
f = @(x) (x^2) / 2 + x + 1 - exp(x);
fd = @(x) x + 1 - exp(x);

x0 = 1;
fprintf("Cu multiplicitate")
```

```
Cu multiplicitate
```

```
tic
[rad, iter] = NewtonCuMult(f, fd, x0, 1)
```

```
rad =
   0.001742178573622
iter =
    16
```

```
toc
```

```
Elapsed time is 0.006459 seconds.
```

```
fprintf("Fara multiplicitate")
```

```
Fara multiplicitate
```

```
tic
[rad, iter] = NewtonFaraMult(f, fd, x0)
```

```
rad =
   0.001742178573622
iter =
    14
```

```
toc
```

```
Elapsed time is 0.005727 seconds.
```

Se observa ca ambele metode converg destul de lent pentru acest exemplu. Asta se poate datora functiei in sine si alegerii valorii de start x0.

```
function [z, k] = NewtonCuMult(f, fd, x0, m, iter_max)
    if nargin < 5; iter_max = 500; end
    er = 0;
    ea = 1e-3;

    x_prev = x0;
    for k = 1 : iter_max
        x_curr = x_prev - m * fd(x_prev) \ f(x_prev);
        if norm(x_curr - x_prev, inf) < ea + er * norm(x_curr, inf) % ok
            z = x_curr;
            return
        end
        x_prev = x_curr;
    end
```

```
    error('numarul maxim de iteratii depasit') % eroare
end

function [z, k] = NewtonFaraMult(f, fd, x0, iter_max)
    if nargin < 5; iter_max = 500; end
    er = 0;
    ea = 1e-3;

    x_prev_2 = x0;
    x_prev_1 = x_prev_2 - fd(x_prev_2) \ f(x_prev_2);
    x_prev = x_prev_1 - fd(x_prev_1) \ f(x_prev_1);

    m_numitor = log(abs((x_prev_1 - x_prev) / (x_prev_2 - x_prev)));
    m_numarator = log(abs(f(x_prev_1) / f(x_prev_2)));
    m = round(m_numarator / m_numitor);


    for k = 1 : iter_max
        x_curr = x_prev - m * fd(x_prev) \ f(x_prev);
        if norm(x_curr - x_prev, inf) < ea + er * norm(x_curr, inf) % ok
            z = x_curr;
            return
        end

        x_prev_2 = x_prev_1;
        x_prev_1 = x_prev;
        x_prev = x_curr;

        m_numitor = log(abs((x_prev_1 - x_prev) / (x_prev_2 - x_prev)));
        m_numarator = log(abs(f(x_prev_1) / f(x_prev_2)));
        m = round(m_numarator / m_numitor);
    end

    error('numarul maxim de iteratii depasit') % eroare
end
```