Lab Assignment 2 (Nonlinear algebraic equation)

1. Let's make subroutines or functions for the Newton's method and the Secant method.
Input : a given function, a starting value x_0, and tolerance ϵ.
output : a root in the interval.

2. Find a root in a given interval based on the Newton's method and the Secant method.
(1) $x^4 - 5x^3 + 9x + 3 = 0$ in $[4, 6]$
(2) $2x^2 + 5 = e^x$ in $[3, 4]$

- Try several initial values for the Newton's method
- Discuss the dependence of initial values for the performance of the two methods.

How to put a function as an input of a function.
(1) Python

Example :

```
def f(x):
  return 2*x*(1-x)

def iterate(seed, num, f) :
  x=seed
  orbit=[x]
  for i in range(num) :
    x=f(x)
    orbit.append(x)
  return orbit
```

where f is an input for the function defined above.

(2) Matlab

```
f=@(x) 2*x.*(1-x) ;

function orbit = iterate(seed, num, f)
  x=seed;
  orbit(1) = x;
  for i=1:num-1
    x=f(x);
    orbit(i+1)=x;
  end
end
```

As you see, you have to use the special character @ to specify the dependent variable x for a function.