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1 function X = NewtonsMethod(f, J, x0, tol, N)
2     % Returns the iterations X of the Newton's method
3     % f: Function handle
4     %     Objective function, i.e. equation f(x)=0
5     % J: Function handle
6     %     Jacobian of f
7     % x0: Initial root estimate, Nx x 1
8     % tol: tolerance
9     % N: Maximum number of iterations
10    if nargin < 5
11        N = 100;
12    end
13    if nargin < 4
14        tol = 1e-6;
15    end
16    %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
17    % Define variables
18    % Allocate space for iterations (X)
19    nx = size(x0,1);
20    X = NaN(nx,N+1);
21    X(:,1) = x0;
22
23    xn = x0; % initial estimate
24    n = 1; % iteration number
25    fn = f(xn); % save calculation
26    % Iterate until f(x) is small enough or
27    % the maximum number of iterations has been reached
28    while norm(fn,Inf) > tol && n <= N
29        % Calculate and save next iteration value x
30        fn = f(xn);
31        Jn = J(xn);
32        dx = -Jn \ fn;
33        xn = xn + dx;
34        X(:,n+1) = xn;
35
36        n = n + 1;
37    end % while
38
39    % remove NaN but keep shape of X
40    X = X(:,1:n);
41 end % function
42

```