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% GRADMETHOD conducts the gradient method with Armijo stepsize algorithm.
% Hereby, the program ARMIJO is applied.
%
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%
% INPUT:
% f ....... function F: R^n -> R to which GRADMETHOD shall be adapted. f
%           shall also return the gradient: function [Fx,dFx] = f(x).
% x0 ...... initial point, x0 in R^n.
% t0 ...... positive initial stepsize.
% eps ..... small parameter for the termination criterion.
% alpha ... parameter for the Armijo stepsize search in [0,1].
% beta .... parameter for the reduction of the stepsize in (0,1).
%
% OUTPUT:
% X ....... matrix with size(X)=[n, iter]. Hereby, iter denotes the
%           number of iterations. X includes the complete iteration
%           sequence (and also the initial point x0), i.e. x^k=X(:,k+1).

function X = gradmethod(f, x0, eps, t0, alpha, beta)

x=x0; X=[x]; [fx,grad]=f(x);               %initializing of iteration

while norm(grad) > eps                     %successful determination
    d = -grad/norm(grad,2);                %descent direction
    t = armijo(f, x, d, t0, alpha, beta);  %choice of stepsize
    x = x+t*d; [fx,grad] = f(x);           %update
    X = [X x];                             %saving of iteration point
end
```