

Siyue Zhu
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HW5

Problem 4

The method of fminbnd takes 0.3079 and the method of gradient descent with tstep=0.01 takes 0.0227. The second method is faster because the tstep can replace many steps, which can save a lot of time.

Problem 5

C

Code

```
%% Problem4
clear; close all; clc

f = @(p) (2-p(1))^2 + (p(2) - p(1)^2)^2;
ans5 = fminsearch(f, [0; 5]);

p = [0; 5]; % The current guess
fgrad = @(p) [-2*(2-p(1))-4*p(1)*(p(2)-p(1)^2); 2*(p(2)-p(1)^2)];
iteration = 0;
tic
for k = 1:10000
    grad = fgrad(p); % Find which direction to go
    phi = @(t) p - t*grad; % Define the "path"
    f_phi = @(t) f(phi(t));
    tmin = fminbnd(f_phi,0,1);
    p = phi(tmin);
    iteration = iteration + 1;
    if norm(grad, inf) < 10^(-4)
        break
    end
end
time_fmin = toc
ans6 = p;
ans7 = iteration;

f = @(p) (2-p(1))^2 + (p(2) - p(1)^2)^2;
p = [0; 5]; % The current guess
fgrad = @(p) [-2*(2-p(1))-4*p(1)*(p(2)-p(1)^2); 2*(p(2)-p(1)^2)];
tstep = 0.01;
iteration = 0;
```

```
tic
for k = 1:10000
    grad = fgrad(p); % Find which direction to go
    p = p - tstep*grad;
    iteration = iteration + 1;
    if norm(grad, inf) < 10^(-4)
        break
    end
end
time_grad = toc
ans8 = iteration;
```