파일1 : height.m

```
function y = height( x )
init_angle = 45*pi/180;
init_velocity = 20;
init_height = 2;
GRAVITATIONAL_CONSTANT = 9.81;
y = tan(init_angle)*x -
GRAVITATIONAL_CONSTANT/(2*init_velocity^2*cos(init_ang
le)^2)*x^2+init_height;
end
```

파일2: gsm.m

```
function [x1, x2, xl, xu, f1, f2, fl, fu, d, ea,
stop_it, xopt, root] = gsm( f, xl_given, xu_given, es,
max_it)

GOLDEN_RATIO = 1.618;
x1 = zeros(max_it+1);
x2 = zeros(max_it+1);
xl = zeros(max_it+1);
xu = zeros(max_it+1);
xopt = zeros(max_it+1);
f1 = zeros(max_it+1);
f2 = zeros(max_it+1);
fl = zeros(max_it+1);
fu = zeros(max_it+1);
d = zeros(max_it+1);
ea = zeros(max_it+1);
xl(1) = xl_given; xu(1) = xu_given;
stop_it = 0;
for i = 1:1:max_it
    d(i) = (GOLDEN_RATIO-1)*(xu(i)-xl(i));
    x1(i) = xl(i)+d(i);
    x2(i) = xu(i)-d(i);
    fl(i) = f(xl(i));
    fu(i) = f(xu(i));
    f1(i) = f(x1(i));
    f2(i) = f(x2(i));

    if f1(i) - f2(i) < 0
        xopt(i) = x1(i);
        xl(i+1) = x2(i);
        xu(i+1) = xu(i);
    elseif f1(i) - f2(i) > 0
        xopt(i) = x2(i);
        xl(i+1) = xl(i);
        xu(i+1) = x1(i);
    end
    ea(i) =
```

```
(2-GOLDEN_RATIO)*abs((xu(i)-xl(i))/xopt(i))*100;
    if ea(i) <= es
        stop_it = i;
        break;
    end
end
if stop_it == 0
    stop_it = max_it;
end
root = xopt(stop_it);
```

파일3: maxHeight.m

```
negFunc = @(x) -height(x);
[x1,x2,xl,xu,f1,f2,fl,fu,d,ea,stop_it,xopt,
root]=gsm(negFunc,10,30,10,100);
fprintf('optimal x = %10.4f\n', root);
fprintf('minimum of f = -height = %10.4f\n',
negFunc(root));
fprintf('maximum of height = %10.4f\n', height(root));
fprintf('%2s%10s%10s%10s%10s%10s%10s%10s%10s%10s%10s%1
0s\n','i','xl','f(xl)','x2','f(x2)','x1','f(x1)','xu',
'f(xu)','d','ea','xopt');
for i = 1:1:stop_it

fprintf('%2d%10.4f%10.4f%10.4f%10.4f%10.4f%10.4f%10.4f
%10.4f%10.4f%10.4f%10.4f\n',i, xl(i), fl(i), x2(i),
f2(i), x1(i), f1(i), xu(i), fu(i),d(i),ea(i),xopt(i));
end
```

실행결과