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```
%%HW#2 Name: Michael Bautista, email:mbautis000@citymail.cuny.edu
```

```
Error using dbstatus
Error: File: /MATLAB Drive/Michael_Bautista_HW2.m Line: 49 Column: 1
Function definitions in a script must appear at the end of the file.
Move all statements after the "drand" function definition to before
 the first local function definition.
```

Question 1

```
%To find c, set the pmf equal to 1 and solve for c by doing 1 /
 sum(sqrt(1:50))
close all; clear all; clc
c = 1 / sum(sqrt(1:50)) ;
n = 1000; n2 = 10.^6;  %10^3 and 10^6 samples
p = c*sqrt(1:50); %PMF

g=drand(1,n,p); g2=drand(1,n2,p);  %drand lets us know what partition
 p fell in

v = histc(g,1:50); v2 = histc(g2,1:50);
phat = v/n; phat2 = v2/n2; %empirical pmf

y= (1:50); %creating values for the line of p
p(y) = c*sqrt(y);

subplot(1,2,1); plot(1:50,p(y),'-',1:50,phat,'o')
xlabel('Value of x')
ylabel('Number of x values')
title('10^3 Samples')
legend('p','phat')
subplot(1,2,2); plot(1:50,p(y),'-',1:50,phat2,'o')
xlabel('Value of x')
ylabel('Number of x values')
title('10^6 Samples')
legend('p','phat')

function x=drand(m,n,p)
    x=zeros(m,n);
    for i=1:m
        for j=1:n
            u=rand;
            f=0;
```

```
            for k=1:length(p)
                f=f+p(k);
                if u<=f
                    break
                end
            end
            x(i,j)=k;
        end
    end
    return
end
```

Question 3

```
%3a: To convert a uniform(0,1) rv U into rv X with pdf f, integrate
 the
%pdf to get the CDF, then use the inverting the CDF method
close all; clear all; clc
n = 1000; %10^3 samples
n2 = 10^6;
r = ones(n,1); %matrix of temporary values to be replaced
r2 = ones(n2,1);
x = rand(n,1); x2 = rand(n2,1);
for i = 1:n
%r(i,1) = (1./ (2.*sqrt(x(i,1))));
r(i,1) = x(i).^2;
end
for i = 1:n2
%r2(i,1) = (1./ (2.*sqrt(x2(i,1))));
r2(i,1) = x2(i).^2;
end

xline = linspace(0,1,100); %Graphing the pdf
yline = 1./ (2.*sqrt(xline)) ;

subplot(1,2,1); histogram(r,'normalization', 'pdf'); hold on
plot(xline,yline);
xlabel('Value of x')
ylabel('Number of x values')
title('10^3 Samples')
subplot(1,2,2); histogram(r2,'normalization', 'pdf'); hold on
plot(xline,yline);
title('10^6 Samples')
xlabel('Value of x')
ylabel('Number of x values')
```

Question 4

```
close all; clear all; clc
n = 1000; %10^3

plot( -2:.001:2, hw3_fn_g(-2:.001:2) ); hold on %from the given
 function
```

```
u1 = rand(n) - 1; u2 = 0.5 + 0.5.*rand(n); %u1 is from -1 to 0, u2 is
 from 0.5 to 1
u3 = rand(n) .* max(hw3_fn_g(u1)) ;
u4 = rand(n) .* max(hw3_fn_g(u2)) ;

values = [];
for i = 1:n
    if u3(i) < hw3_fn_g(u1(i)) %checking values less than f(ui) for
 acc
        values=[values,u1(i)];
    end
end

values2 = [];
for i = 1:n
    if u4(i) < hw3_fn_g(u2(i)) %checking values less than f(ui) for
 acc
        values2=[values2,u2(i)];
    end
end

histogram(values,'normalization','pdf'); hold on
histogram(values2, 'normalization','pdf');

function g=hw3_fn_g(x)
% The function g for HW #3.
% Note that the input x can be a vector
% For example, the following command
%   plot( -2:.001:2, hw3_fn_g(-2:.001:2) ) will plot the function g(x)
%       on the domain [-2,2]

g=(sin(10*x)).^2 .* abs( x.^3 + 2.*x - 3 ) .* ( ( x>-1 & x<0 ) |
 ( x>1/2 & x<1 ) );
end
```

Question 5

```
close all; clear all; clc
n = 1000; %10^3

plot( -2:.001:2, hw3_fn_g(-2:.001:2) ); hold on
u1 = rand(n);
u3 = rand(n) .* max(hw3_fn_g(u1)) ;

values = [];
for i = 1:n
    if u3(i) < hw3_fn_g(u1(i))
        values=[values,u1(i)];
    end
end

histogram(values,'normalization','pdf');
```

```
function g=hw3_fn_g(x)
% The function g for HW #3.
% Note that the input x can be a vector
% For example, the following command
%   plot( -2:.001:2, hw3_fn_g(-2:.001:2) ) will plot the function g(x)
%       on the domain [-2,2]

%g=(sin(10*x)).^2 .* abs( x.^3 + 2.*x - 3 ) .* ( ( x>-1 & x<0 ) |
 ( x>1/2 & x<1 ) );
g = (1./ (2.*sqrt(x)) ) .* sqrt( abs(sin(10./(1 +
 abs( log(x)) ) ) )) .* (0 < x & x < 1 ) ;
end
```

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