Chapter 7
Solved Problems

Problem 1

Script file:

```
clear, clc
disp('Part (a)')
x=[-1.5 5];
y=math(x);
disp('The test values for y(x) are:')
disp(y)
%
%part b
x=-2:.1:6;
plot(x,math(x));
title('y(x)=(-0.2x^3 + 7x^2)e^{-0.3x}')
xlabel('x-->')
ylabel('y-->')
```

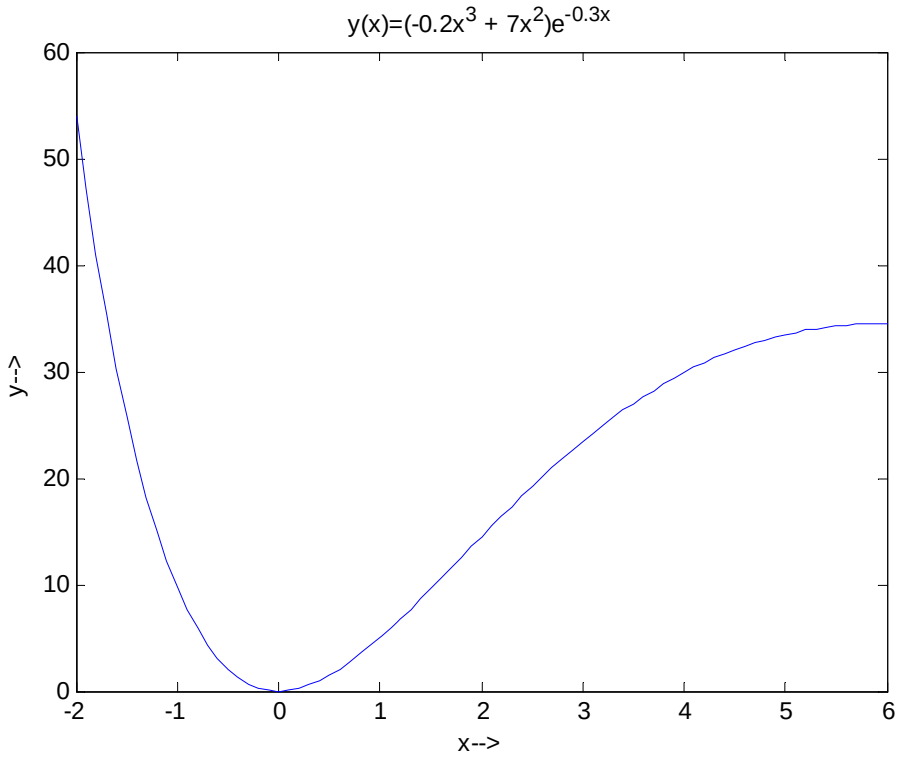
Function file:

```
function y = math(x)
y=(-0.2*x.^3+7*x.^2).*exp(-0.3*x);
```

Command Window:

```
Part (a)
The test values
for y(x) are:
   25.7595
33.4695
```

Figure Window:



Problem 2

Script file:

```
clear, clc
disp('Part (a)')
th=[pi/6, 5*pi/6];
r=polarmath(th);
disp('The test values for r(theta) are:')
disp(r)
%
%part b
th=linspace(0,2*pi,200);
polar(th,polarmath(th));
title('r(\theta)=4cos(4sin(\theta))')
```

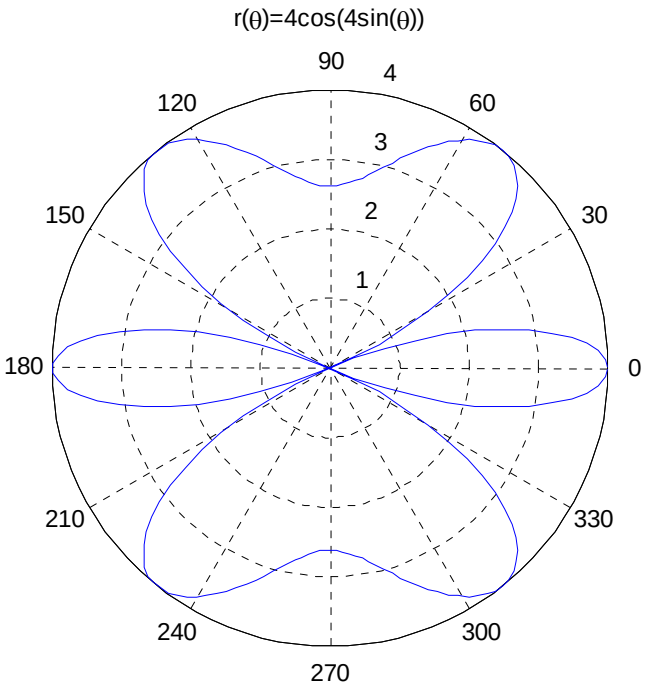
Function file:

```
function r = polarmath(theta)
%angles in radians
r=4*cos(4*sin(theta));
```

Command Window:

```
Part (a)
The test values for r(theta) are:
   -1.6646   -1.6646     1
```

Figure Window:



Problem 3

Script file:

```
clear, clc
disp('Part (a)')
gmi=5;
Lkm = LkmToGalm(gmi);
disp('The fuel consumption of a Boeing 747 in liters/km is:')
disp(Lkm)
disp('Part (b)')
gmi=5.8;
Lkm = LkmToGalm(gmi);
disp('The fuel consumption of a Concorde in liters/km is:')
disp(Lkm)
```

Function file:

```
function Lkm = LkmToGalm(gmi)
Lkm = gmi*4.40488/1.609347;
```

Command Window:

```
Part (a)
The fuel consumption of a Boeing 747 in liters/km is:
   13.6853
Part (b)
The fuel consumption of a Concorde in liters/km is:
   15.8750
```

Problem 4

Script file:

```
clear, clc
disp('Part (a)')
den=7860;
sw = DenTOSw(den);
disp('The specific weight of steel in lb/in^3 is:')
disp(sw)
disp('Part (b)')
den=4730;
sw = DenTOSw(den);
disp('The specific weight of titanium in lb/in^3 is:')
disp(sw)
```

Function file:

```
function sw = DenTOSw(den)
sw=den/2.76799e4;
```

Command Window:

```
Part (a)
The specific weight of steel in lb/in^3 is:
    0.2840
Part (b)
The specific weight of titanium in lb/in^3 is:
    0.1709
```

Problem 5

Script file:

```
kts=400;
fps = ktsTOfps(kts);
fprintf('A speed of 400 kts is %.1f ft/s\n',fps)
```

Function file:

```
function fps = ktsTOfps(kts)
fps=kts*6076.1/3600;
```

Command Window:

```
A speed of 400 kts is 675.1 ft/s
```

Problem 6

Script file:

```
clear, clc
disp('Part (a)')
w=95; h=1.87;
BSA = BodySurA(w,h);
fprintf('The body surface area of a %.0f kg, %.2f m patient is %.3f
m^2\n',w,h,BSA)
disp('Part (b)')
w=61; h=1.58;
BSA = BodySurA(w,h);
fprintf('The body surface area of a %.0f kg, %.2f m patient is %.3f
m^2\n',w,h,BSA)
```

Function file:

```
function BSA = BodySurA(w,h)
BSA = 0.007184*w^0.425*h^0.75;
```

Command Window:

```
Part (a)
The body surface area of a 95 kg, 1.87 m patient is 0.080 m^2
Part (b)
The body surface area of a 61 kg, 1.58 m patient is 0.058 m^2
```

Problem 7

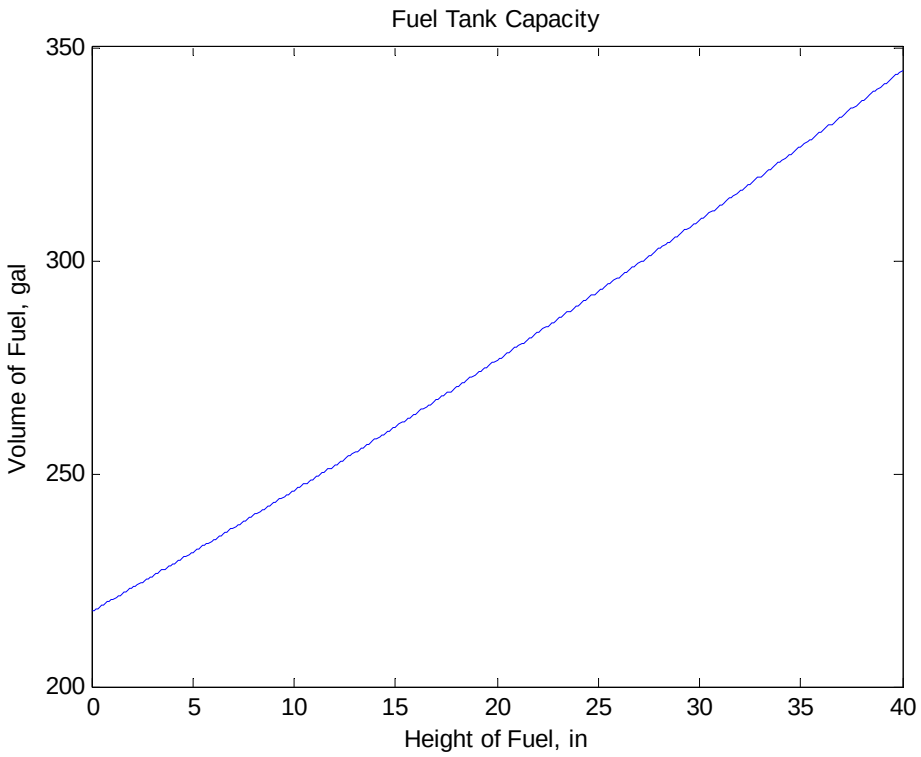
Script file:

```
clear, clc
y=0:.1:40;
plot(y,Volfuel(y))
title('Fuel Tank Capacity')
xlabel('Height of Fuel, in')
ylabel('Volume of Fuel, gal')
```

Function file:

```
function V = Volfuel(y)
r=20; H=2*r;
ry=(1+0.5*y/H)*r;
V=0.004329*pi*H*(r^2+r*ry+ry.^2)/3;
```

Figure Window:



Problem 8

Script file:

```
clear, clc
gamma=0.696; r=0.35; d=0.12; t=0.002;
coat=@(r,d,t,gamma) gamma*t*pi^2*(2*r+d)*d;
weight=coat(r,d,t,gamma);
fprintf('The required weight of gold is %.5f lb\n',weight)
```

Command Window:

```
The required weight of gold is 0.00135 lb
```

Problem 9

Script file:

```
clear, clc
T=35; V=26;
Twc = WindChill(T,V);
fprintf('For conditions of %.0f degF and %.0f mph',T,V)
fprintf(' the wind chill temperature is %.1f degF\n\n',Twc)
disp('Part (b)')
T=10; V=50;
Twc = WindChill(T,V);
fprintf('For conditions of %.0f degF and %.0f mph',T,V)
fprintf(' the wind chill temperature is %.1f degF\n\n',Twc)
```

Function file:

```
function Twc = WindChill(T,V)
C1=35.74; C2=0.6215; C3=-35.75; C4=0.4275;
Twc = C1+C2*T+C3*V^0.16+C4*T*V^0.16;
```

Command Window:

```
Part (a)
For conditions of 35 degF and 26 mph the wind chill temperature is 22.5 degF

Part (b)
For conditions of 10 degF and 50 mph the wind chill temperature is -16.9 degF
```

Problem 10

Script file:

```
clear, clc
g=[3.7 3 3.3 2 0 4 1.3 4];
h=[4 3 3 2 3 4 3 3];
av = GPA(g,h);
fprintf('The student''s grade point average is %.2f\n',av)
```

Function file:

```
function av = GPA(g,h)
av = sum(g.*h)/sum(h);
```

Command Window:

```
The student's grade point average is 2.78
```

Problem 11

Script file:

```
clear, clc
disp('Part (a)')
x=9;
y = fact(x);
if y>0
    fprintf('The factorial of %i is %i\n\n',x,y)
end
disp('Part (b)')
x=8.5;
y = fact(x);
if y>0
    fprintf('The factorial of %i is %i\n\n',x,y)
end
disp('Part (c)')
x=0;
y = fact(x);
if y>0
    fprintf('The factorial of %i is %i\n\n',x,y)
end
disp('Part (d)')
x=-5;
y = fact(x);
if y>0
    fprintf('The factorial of %i is %i\n\n',x,y)
end
```

Function file:

```
function y = fact(x)
if x<0
    y=0;
    fprintf('Error: Negative number inputs are not allowed\n\n')
elseif floor(x)~=x
    y=0;
    fprintf('Error: Non-integer number inputs are not allowed\n\n')
elseif x==0
    y=1;
else
    y=1;
    for k=1:x
        y=y*k;
    end
end
```

Command Window:

```
Part (a)
The factorial of 9 is 362880

Part (b)
```

```
Error: Non-integer number inputs are not allowed

Part (c)
The factorial of 0 is 1

Part (d)
Error: Negative number inputs are not allowed
```

Problem 12

Script file:

```
clear, clc
disp('Part (a)')
A=[-5 -1 6]; B=[2.5 1.5 -3.5]; C=[-2.3 8 1];
th = anglines(A,B,C);
fprintf('The angle between the points is %.1f degrees\n\n',th)
disp('Part (b)')
A=[-5.5 0]; B=[3.5,-6.5]; C=[0,7];
th = anglines(A,B,C);
fprintf('The angle between the points is %.1f degrees\n\n',th)
```

Function file:

```
function th = anglines(A,B,C)
BA = A-B; BC = C-B;
th=acosd(dot(BA,BC)/(sqrt(sum(BA.^2))*sqrt(sum(BC.^2))));
```

Command Window:

```
Part (a)
The angle between the points is 56.9 degrees

Part (b)
The angle between the points is 39.6 degrees
```

Problem 13

Script file:

```
clear, clc
disp('Part (a)')
A=[1.2 3.5]; B=[12 15];
n=unitvec(A,B);
disp('The unit vector is:')
disp(n)
disp('Part (b)')
A=[-6 14.2 3]; B=[6.3 -8 -5.6];
n=unitvec(A,B);
disp('The unit vector is:')
disp(n)
```

Function file:

```
function n=unitvec(A,B)
n=(B-A)/sqrt(sum((B-A).^2));
```

Command Window:

```
Part (a)
The unit vector is:
    0.6846    0.7289
Part (b)
The unit vector is:
    0.4590   -0.8284   -0.3209
```

Problem 14

Script file:

```
clear, clc
disp('Part (a)')
a=[3 11]; b=[14,-7.3];
r=crosspro(a,b);
disp('The cross product vector is:')
disp(r)
disp('Part (b)')
c=[-6 14.2 3]; d=[6.3 -8 -5.6];
s=crosspro(c,d);
disp('The cross product vector is:')
disp(s)
```

Function file:

```
function w = crosspro(u,v)
n=length(u);
if n == 2
    u(3)=0;
    v(3)=0;
end
w(1)=u(2)*v(3)-u(3)*v(2);
w(2)=u(3)*v(1)-u(1)*v(3);
w(3)=u(1)*v(2)-u(2)*v(1);
```

Command Window:

```
Part (a)
The cross product vector is:
         0         0 -175.9000
Part (b)
The cross product vector is:
  -55.5200  -14.7000  -41.4600
```

Problem 15

Script file:

```
clear, clc
disp('Part (a)')
A=[1,2]; B=[10,3]; C=[6,11];
Area = TriArea(A,B,C);
fprintf('The area of the triangle is %.1f\n\n',Area)
disp('Part (b)')
A=[-1.5, -4.2, -3]; B=[-5.1, 6.3, 2]; C=[12.1, 0, -0.5];
Area = TriArea(A,B,C);
fprintf('The area of the triangle is %.1f\n\n',Area)
```

Function files:

```
function Area = TriArea(A,B,C)
[AB AC] = sides(A,B,C);
Area = sqrt(sum(crosspro(AB,AC).^2))/2;
end

function [AB AC] = sides(A,B,C)
AB = B-A; AC = C-A;
end


function w = crosspro(u,v)
n=length(u);
if n == 2
    u(3)=0;
    v(3)=0;
end
w(1)=u(2)*v(3)-u(3)*v(2);
w(2)=u(3)*v(1)-u(1)*v(3);
w(3)=u(1)*v(2)-u(2)*v(1);
end
```

Command Window:

```
Part (a)
The area of the triangle is 38.0

Part (b)
The area of the triangle is 87.9
```

Problem 16

Script file:

```
clear, clc
disp('Part (a)')
A=[1,2]; B=[10,3]; C=[6,11];
cr = cirtriangle(A,B,C);
fprintf('The perimeter of the triangle is %.1f\n\n',cr)
disp('Part (b)')
A=[-1.5, -4.2, -3]; B=[-5.1, 6.3, 2]; C=[12.1, 0, -0.5];
cr = cirtriangle(A,B,C);
fprintf('The perimeter of the triangle is %.1f\n\n',cr)
```

Function file:

```
function cr = cirtriangle(A,B,C)
vlength = @(A,B) sqrt(sum((B-A).^2));
cr=vlength(A,B) + vlength(B,C) + vlength(C,A);
```

Command Window:

```
Part (a)
The perimeter of the triangle is 28.3

Part (b)
The perimeter of the triangle is 45.1
```

Problem 17

Script file:

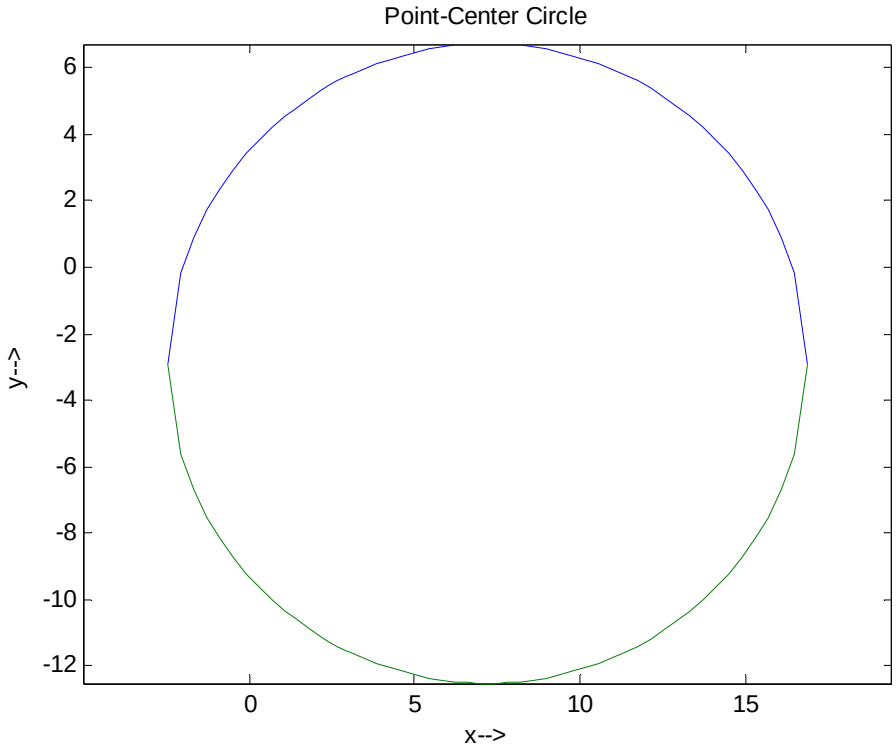
```
clear, clc
disp('Part (a)')
c=[7.2, -2.9]; p=[-1.8, 0.5];
figure(1)
circlePC(c,p)
disp('Part (b)')
c=[-0.9,-3.3]; p=[0,10];
figure(2)
circlePC(c,p)
```

Function file:

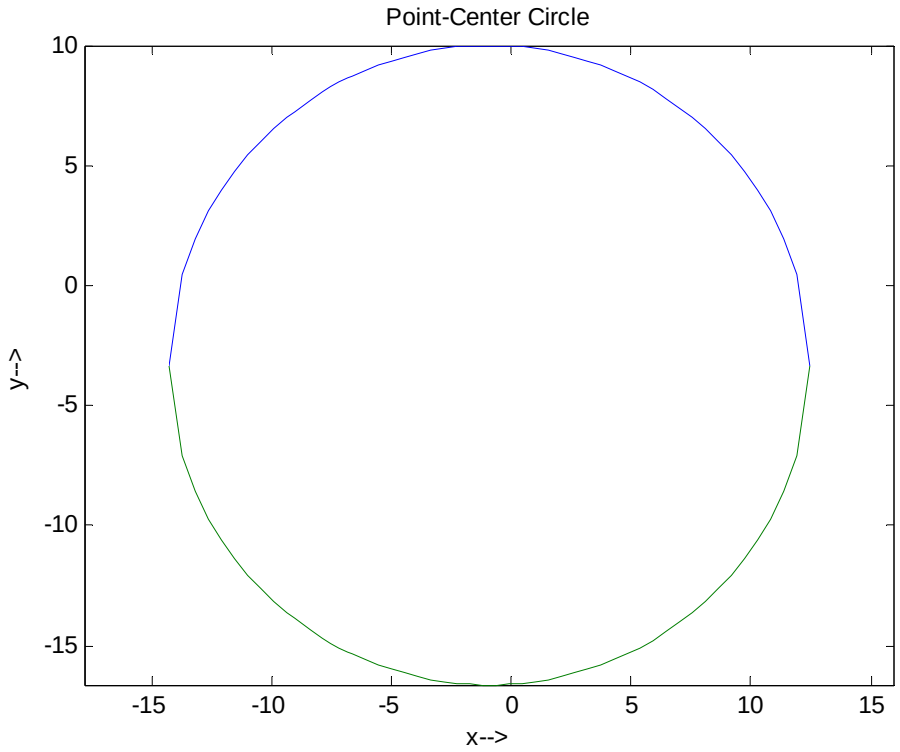
```
function circlePC(c,p)
vlength = @(A,B) sqrt(sum((B-A).^2));
r=vlength(c,p);
x=linspace(c(1)-r,c(1)+r,50);
y1=sqrt(r^2-(x-c(1)).^2)+c(2);
y2=-sqrt(r^2-(x-c(1)).^2)+c(2);
plot(x,y1,x,y2)
title('Point-Center Circle')
axis equal
xlabel('x-->')
ylabel('y-->')
```

Figure Windows:

(a)



(b)



Problem 18

Script file:

```
disp('Part (a)')
d=100;
b = Bina(d);
if b>=0
    disp('The binary decomposition is:')
    disp(b)
end
disp('Part (b)')
d=1002;
b = Bina(d);
if b>=0
    disp('The binary decomposition is:')
    disp(b)
end
disp('Part (c)')
d=52601;
b = Bina(d);
if b>=0
    disp('The binary decomposition is:')
    disp(b)
end



disp('Part (d)')
d=2000090;
b = Bina(d);
if b>=0
    disp('The binary decomposition is:')
    disp(b)
end
```

Function file:

```
function b = Bina(d)
if d>=2^16
    b=-1;
    fprintf('The integer is too large for this routine\n')
else
    n=floor(log(d)/log(2));
    b=[];
    for k=n:-1:0
        p=floor(d/2^k);
        b=[b p];
        d=d-p*2^k;
    end
end
```

Command Window:

```
Part (a)
The binary decomposition is:
     1     1     0     0     1     0     0
Part (b)
The binary decomposition is:
     1     1     1     1     1     0     1     0     1     0
Part (c)
The binary decomposition is:
  Columns 1 through 13
     1     1     0     0     1     1     0     1     0     1     1     1
1
  Columns 14 through 16
     0     0     1
Part (d)
The integer is too large for this routine
```

Problem 19

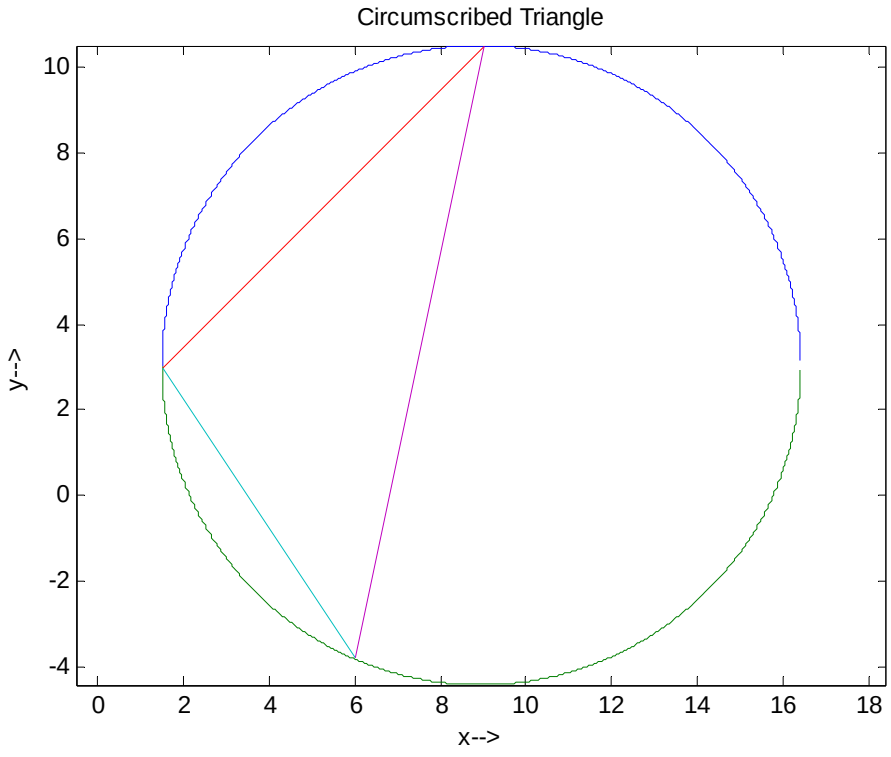
Script file:

```
A=[1.5, 3]; B=[9,10.5]; C=[6,-3.8];
TriCirc(A,B,C)
```

Function file:

```
function TriCirc(A,B,C)
%note - ignoring possibility of vertical/horizontal edges
midAB=(A+B)/2;
abisectorAB=-(A(1)-B(1))/(A(2)-B(2));
bbisectorAB=midAB(2)-abisectorAB*midAB(1);
midBC=(B+C)/2;
abisectorBC=-(B(1)-C(1))/(B(2)-C(2));
bbisectorBC=midBC(2)-abisectorBC*midBC(1);
mat=[-abisectorAB 1; -abisectorBC 1]; col=[bbisectorAB; bbisectorBC];
center=mat\col; r=sqrt((A(1)-center(1))^2 + (A(2)-center(2))^2)
x=center(1)-r:.01:center(1)+r;
y1=center(2)+sqrt(r^2 - (x-center(1)).^2);
y2=center(2)-sqrt(r^2 - (x-center(1)).^2);
plot(x,y1,x,y2,[A(1) B(1)],[A(2) B(2)],[A(1) C(1)],[A(2) C(2)],...
    [B(1) C(1)],[B(2) C(2)])
axis equal
title('Circumscribed Triangle')
xlabel('x-->')
ylabel('y-->')
```

Figure Window:



Problem 20

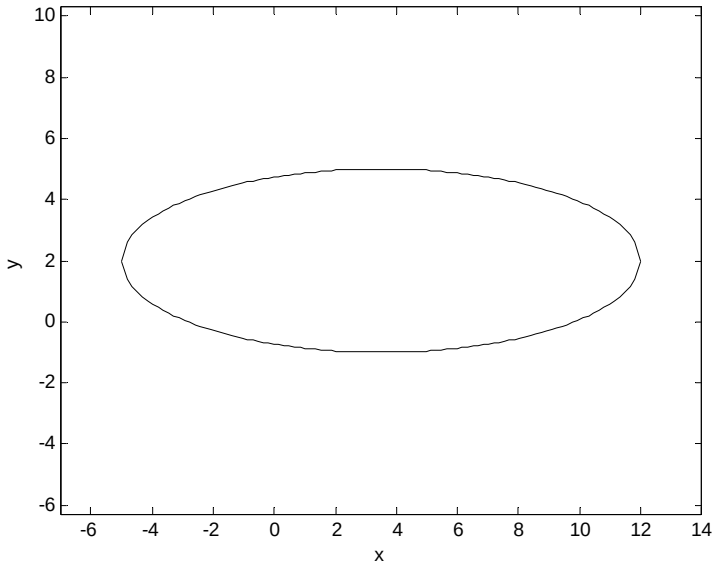
Script file:

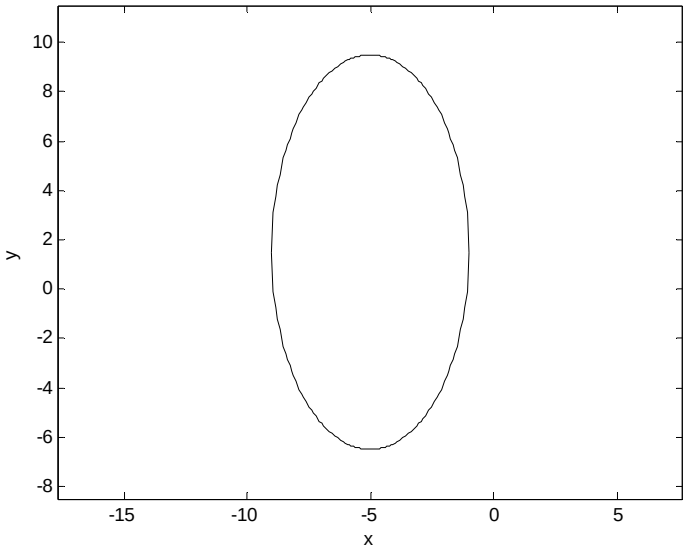
```
figure(1)
xc=3.5; yc=2.0; a=8.5; b=3;
ellipseplot(xc,yc,a,b)
figure(2)
xc=-5; yc=1.5; a=4; b=8;
ellipseplot(xc,yc,a,b)
```

Function file:

```
function ellipseplot(xc,yc,a,b)
x=linspace(-a,a,100);
y=sqrt(b^2*(1-x.^2/a^2));
xp=x+xc;
ypp=y+yc;
ypm=-y+yc;
plot(xp,ypp,'k',xp,ypm,'k')
%axis square
axis([xc-a-2,xc+a+2,yc-b-2,yc+b+2])
axis equal
xlabel('x'), ylabel('y')
```

Figure Windows




10
8
6
4
2
0
-2
-4
-6
-8
y
-15
-10
-5
0
5
x

Problem 21

Script file:

```
disp('Part (a)')
r1=5; th1=23; r2=12; th2=40;
[r th] = AddVecPol(r1,th1,r2,th2)
disp('Part (b)')
r1=6; th1=80; r2=15; th2=125;
[r th] = AddVecPol(r1,th1,r2,th2)
```

Function file:

```
function [r th] = AddVecPol(r1,th1,r2,th2)
x1=r1*cosd(th1); y1=r1*sind(th1);
x2=r2*cosd(th2); y2=r2*sind(th2);
x=x1+x2; y=y1+y2;
r=sqrt(x^2+y^2); th=atan2d(y,x);
```

Command Window:

```
Part (a)
r =
   16.8451
th =
   35.0215
Part (b)
r =
   19.7048
th =
  112.5663
```

Problem 22

User-defined function:

```
function pr=prime(m,n)
% prime determines all the prime numbers between m and n.
% Input argument:
% m  An interger.
% n  An interger (n>m).
% Output argument:
% pr  A vector whose elements are the prime numbers between 1 and n.
if n<=0
    pr='Error';
    disp('ERROR: Input argument must be a positive integer')
elseif round(n)~=n | round(m)~=m
    pr='Error';
    disp('ERROR: Input argument must be positive integer')
elseif n <= m
    pr='Error';
    disp('ERROR: n must be greater than m')
else
    k=1;
    for i=m:n
        c=0;
        for j=2:i-1
            if rem(i,j)==0
                c=1;
                break
            end
        end
        if c==0
            pr(k)=i;
            k=k+1;
        end
     end
end
```

Command Window:

22.*a*

```
>> pr=prime(12,80)
pr =
  Columns 1 through 9
    13    17    19    23    29    31    37    41    43
  Columns 10 through 17
    47    53    59    61    67    71    73    79
```

22.*b*

```
>> pr=prime(21,63.5)
ERROR: Input argument must be positive integer
```

```
pr =
Error
```

22.*c*

```
>> pr=prime(100,200)
pr =
  Columns 1 through 9
   101   103   107   109   113   127   131   137   139
  Columns 10 through 18
   149   151   157   163   167   173   179   181   191
  Columns 19 through 21
   193   197   199
```

22.*d*

```
>> pr=prime(90,50)
ERROR: n must be greater than m
pr =
Error
```

Problem 23

Script file:

```
year=1978:1987;
Infl=[1.076 1.113 1.135 1.103 1.062 1.032 1.043 1.036 1.019 1.036];
GeometricMeanInflation = Geomean(Infl)
```

Function file:

```
function GM = Geomean(x)
GM = prod(x)^(1/length(x));
end
```

Command Window:

```
GeometricMeanInflation =
   1.0648
```

Problem 24

User-defined function:

```
function [theta, radius]=CartesianToPolar(x,y)
radius= sqrt(x^2+y^2);
theta=acos(abs(x)/radius)*180/pi;
if (x<0)&(y>0)
    theta=180-theta;
end
if (x>0)&(y<0)
    theta=-theta;
end
if (x<=0)&(y<0)
    theta=theta-180;
end
```

Command Window:

```
>> [th_a, radius_a]=CartesianToPolar(14,9)
th_a =
   32.7352
radius_a =
   16.6433
>> [th_b, radius_b]=CartesianToPolar(-11,-20)
th_b =
 -118.8108
radius_b =
   22.8254
>> [th_c, radius_c]=CartesianToPolar(-15,4)
th_c =
  165.0686
radius_c =
   15.5242
>> [th_d, radius_d]=CartesianToPolar(13.5,-23.5)
th_d =
  -60.1240
radius_d =
   27.1017
```

Problem 25

Function file:

```
function m=mostfrq(x)
n=length(x);
a=x==x(1);
av=x(a);
b(1,1)=av(1);
b(1,2)=length(av);
j=2;
for i=2:n
    flag=1;
    for k=1:j-1
        if x(i)==b(k,1)
            flag=0;
        end
    end
        if flag==1
            a=x==x(i);
            av=x(a);
            b(j,1)=av(1);
            b(j,2)=length(av);
            j=j+1;
        end
end
[tmax ni]=max(b(:,2));
tmaxi=b==tmax;
tmaxtot=sum(tmaxi(:,2));
if tmaxtot > 1
    m=('There in more than one value for the mode.');
else
m(1,1)=b(ni,1);
m(1,2)=tmax;
end
```

Command Window:

```
>> d=randi(10,1,20)
d =
     1     3     9     1    10     8     5     6     3     5    10     6
6     3     5     7     7     4     4    10
>> m=mostfrq(d)
m =
There in more than one value for the mode.
>> d=randi(10,1,20)
d =
     1     9    10     8     1     3     4     7     2     8     2     7
5     8     8    10     9     4     7     2
>> m=mostfrq(d)
m =
     8     4
>> d=randi(10,1,20)
```

```
d =
     1     8     6     5    10     7     7     9     9     6     2     3
9     1     5     2    10     8     6     5
>> m=mostfrq(d)
m =
There in more than one value for the mode.
```

Problem 26

Script file:

```
x=randi([-30 30],1,14)
y=downsort(x)
```

Function file:

```
function y=downsort(x)
y=x;
n=length(y);
for k=1:n-1
    for j=k+1:n
        if y(k)<y(j)
            temp=y(k);
            y(k)=y(j);
            y(j)=temp;
        end
    end
end
```

Command Window:

```
x =
   4   -2  -30  -10  -21   18  -12    2  -20    6  -14    9   12   15
y =
  18   15   12    9    6    4    2   -2  -10  -12  -14  -20  -21  -30
```

Problem 27

Script file:

```
A=randi([-30 30], 4, 7)
B=matrixsort(A)
```

Function files:

```
function B = matrixsort(A)
[n,m]=size(A); ntm=n*m;
C=reshape(A',1,ntm);
D=downsort(C);
B=reshape(D,m,n)';

function y=downsort(x)
y=x;
n=length(y);
for k=1:n-1
    for j=k+1:n
        if y(k)<y(j)
            temp=y(k);
            y(k)=y(j);
            y(j)=temp;
        end
    end
end
```

Command Window:

```
A =
   27  -16  -28    9   15   -8   26
   28   -9  -20   -3  -19    8   17
    5   20    9    3   11   17   -1
  -27  -30   14  -12  -19  -26   -4
B =
   28   27   26   20   17   17   15
   14   11    9    9    8    5    3
   -1   -3   -4   -8   -9  -12  -16
  -19  -19  -20  -26  -27  -28  -30
```

Problem 28

Script file:

```
x=randi([-20 100],4,6)
[Em,rc] = matrixmax(x)
```

Function file:

```
function [Em,rc] = matrixmax(A)
[n,m]=size(A);
Em = A(1,1)-1;
for j=1:n
    for k=1:m
        if A(j,k)>Em
            Em=A(j,k);
            rc=[j k];
        end
    end
end
```

Command Window:

```
x =
   78    3   22   90   26   44
    9   10   80   14   48   74
   92   54   50   71  -11   93
   22   37   46   71  -14   -5
Em =
   93
rc =
    3    6
```

Problem 29

Script file:

```
disp('Part (a)')
A=[1 3 2; 6 5 4; 7 8 9];
d3 = det3by3(A)
disp('Part (b)')
A=[-2.5 7 1; 5 -3 -2.6; 4 2 -1];
d3 = det3by3(A)
```

Function files:

```
function d3 = det3by3(A)
d3=A(1,1)*det2by2(A(2:3,2:3)) - A(1,2)*det2by2(A(2:3,[1 3])) + ...
    A(1,3)*det2by2(A(2:3,1:2));
function d2 = det2by2(B)
d2=B(1,1)*B(2,2)-B(1,2)*B(2,1);
```

Command Window:

```
Part (a)
d3 =
   -39
Part (b)
d3 =
  -36.3000
```

Problem 30

Script file:

```
disp('Part (a)')
S=[160, -40, 60]; th=20;
disp('Stress in x''-y'' coordinate system in MPa')
Stran = StressTrans(S,th)
disp('Part (b)')
S=[-18, 10, -8]; th=20;
disp('Stress in x''-y'' coordinate system in ksi')
Stran = StressTrans(S,65)
```

Function file:

```
function Stran = StressTrans(S,th)
Stran(1)=0.5*(S(1)+S(2)) + 0.5*(S(1)-S(2))*cosd(2*th) + S(3)*sind(2*th);
Stran(2)=S(1)+S(2)-Stran(1);
Stran(3)=-0.5*(S(1)-S(2))*sind(2*th) + S(3)*cosd(2*th);
end
```

Command Window:

```
Part (a)
Stress in x'-y' coordinate system in MPa
Stran =
  175.1717  -55.1717  -18.3161
Part (b)
Stress in x'-y' coordinate system in ksi
Stran =
   -1.1293   -6.8707   15.8669
```

Problem 31

Script file:

```
disp('Part (a)')
T=78; Tw=66; BP=29.09;
[Td,RH] = DewptRhum(T,Tw,BP)
disp('Part (b)')
T=97; Tw=88; BP=30.12;
[Td,RH] = DewptRhum(T,Tw,BP)
```

Function file:

```
function [Td,RH] = DewptRhum(T,Tw,BP)
TC = @(T) (T-32)*5/9;
TF = @(T) 9*T/5 +32;
PM = @(BP) 33.863886667*BP;
T=TC(T); Tw=TC(Tw);
es=6.112*exp(17.67*T/(T+243.5));
ew=6.112*exp(17.67*Tw/(Tw+243.5));
e=ew-PM(BP)*(T-Tw)*0.00066*(1+0.00115*Tw);
RH=100*e/es;
Td=243.5*log(e/6.112)/(17.67-log(e/6.112));
Td=TF(Td);
Td=round(10*Td)/10;
RH=round(10*RH)/10;
```

Command Window:

```
Part (a)
Td =
    59.6
RH =
    53.1
Part (b)
Td =
    85.5
RH =
    69.7
```

Problem 32

Script file:

```
disp('Part (a)')
x=lotto(1,59,7)
disp('Part (b)')
x=lotto(50,65,8)
disp('Part (c)')
x=lotto(-25,-2,9)
```

Function file:

```
function x=lotto(a,b,n)
v=rand(1,n);
list=a:b;
x=[];
for k=1:n
    index=round(v(k)*(length(list)-1)+1.5);
    x(k)=list(index);
    list(index)=[];
end
```

Command Window:

```
Part (a)
x =
  45   23   34    6    4   33   48
Part (b)
x =
  65   52   59   57   51   56   54   63
Part (c)
x =
 -17  -12  -21   -9  -19   -8   -7   -6  -15
```

Problem 33

Script file:

```
format short g
disp('Part (a)')
cos67=cosTay(67)
diff=abs(cosd(67)-cos67)
disp('Part (b)')
cos200=cosTay(200)
diff=abs(cosd(200)-cos200)
disp('Part (c)')
cos_neg_80=cosTay(-80)
diff=abs(cosd(-80)-cos_neg_80)
disp('Part (d)')
cos794=cosTay(794)
diff=abs(cosd(794)-cos794)
disp('Part (e)')
cos20000=cosTay(20000)
diff=abs(cosd(20000)-cos20000)
disp('Part (f)')
cos_neg_738=cosTay(-738)
diff=abs(cosd(-738)-cos_neg_738)
```

Function file:

```
function y=cosTay(x)
format long
if abs(x/360) >= 1
    x=x-fix(x/360)*360;
end
xrad=x*pi/180; sum=0;
for i=1:1000
    n=i-1;
    sum=sum+(((-1)^n)*(xrad^(2*n))/factorial(2*n));
    S(i)=sum;
    if i>=2
    E=abs((S(i)-S(i-1))/S(i-1));
        if E<=0.0000001
        break
        end
    end
end
y=sum;
```

Command Window:

```
Part (a)
cos67 =
   0.390731128591239
diff =
     1.019652695610773e-10
Part (b)
cos200 =
```

```
  -0.939692620020872
diff =
     7.650369227008014e-10
Part (c)
cos_neg_80 =
   0.173648177657020
diff =
     9.910405829316460e-12
Part (d)
cos794 =
   0.275637355814150
diff =
     2.849442903851696e-12
Part (e)
cos20000 =
  -0.939692620020872
diff =
     7.650369227008014e-10
Part (f)
cos_neg_738 =
   0.951056516297732
diff =
     2.578826041599314e-12
```

Problem 34

Script file:

```
w=10; h=7; d=1.75; t=0.5;
yc=centroidU(w,h,t,d)
```

Function file:

```
function yc = centroidU(w,h,t,d)
yc=(d*(w-2*t)*(h-d/2)+t*h^2)/(2*h*t+d*(w-2*t));
```

Command Window:

```
yc =

    5.3173
```

Problem 35

Script file:

```
w=12; h=8; d=2; t=0.75;
Ixc=IxcTBeam(w,h,t,d)
```

Function files:

```
function Ixc = IxcTBeam(w,h,t,d)
yc = centroidU(w,h,t,d);
Ixc = 2*(t*h^3/12+t*h*(h/2-yc)^2) + (w-2*t)*d^3+(w-2*t)*d*(h-d/2-yc)^2;

function yc = centroidU(w,h,t,d)
yc=(d*(w-2*t)*(h-d/2)+t*h^2)/(2*h*t+d*(w-2*t));
```

Command Window:

```
Ixc =

  216.7273
```

Problem 36

Script file:

```
R=input('Please input the size of the resistor: ');
L=input('Please input the size of the inductor: ');
%can use logspace or explicitly create an appropriate array for w
power=1:.01:6;
w=10.^power;
RV=LRFilt(R,L,w);
semilogx(w,RV)
title('LR Circuit Response')
xlabel('Frequency, rad/s')
ylabel('Throughput')
```

Function file:

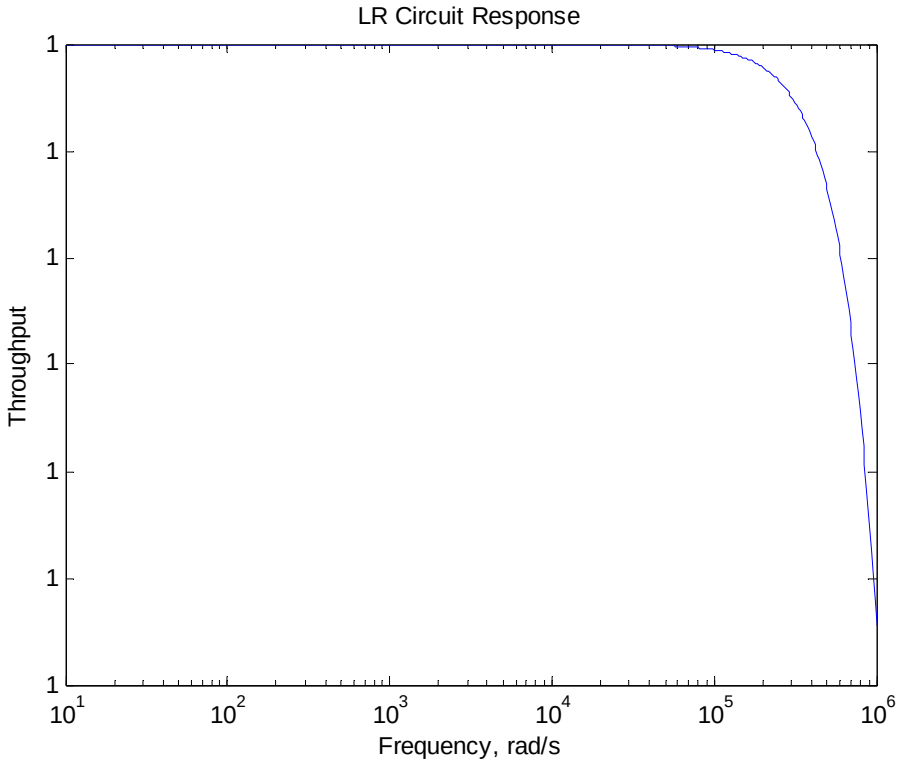
```
function RV=LRFilt(R,L,w)
RV=1./sqrt(1+(w*L/R).^2);
```

Command Window:

Please input the size of the resistor: 600

Please input the size of the inductor: 0.14e-6

Figure Window:



Problem 37

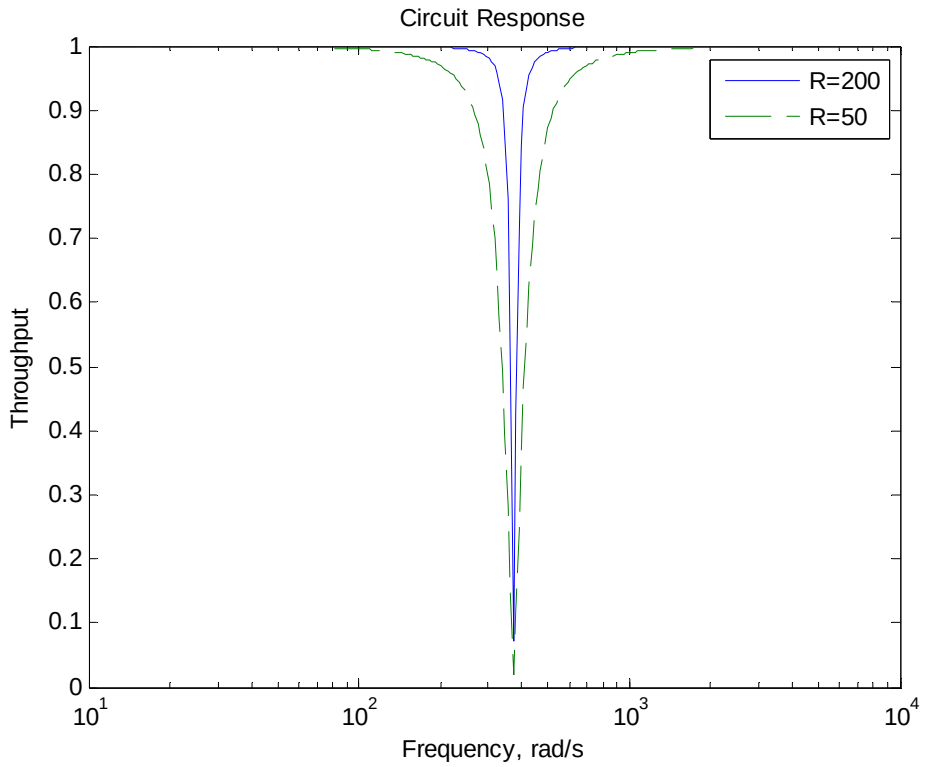
Script file:

```
C=160*10^-6; L=.045; R=200;
%note can use logspace or explicitly create appropriate array of w
power=1:.01:4;
w=10.^power;
RV1=filtfreq(R,C,L,w);
R=50;
RV2=filtfreq(R,C,L,w);
semilogx(w,RV1,w,RV2,'--')
title('Circuit Response')
xlabel('Frequency, rad/s')
ylabel('Throughput')
legend('R=200','R=50')
```

Function file:

```
function RV = filtfreq(R,C,L,w)
RV= abs(R*(1-w.^2*L*C))./sqrt((R-R*w.^2*L*C).^2 + (w*L).^2);
```

Figure Window:



Problem 38

Script file:

```
disp(' ')
disp('Part (a)')
Func=@(x) x^3*exp(2*x);
dxdy=Funder(Func,0.6)
disp(' ')
disp('Part (b)')
Func=@(x) 3^x/x^2;
dxdy=Funder(Func,2.5)
```

Function file:

```
function dfdx = Funder(Fun,x0)
dfdx=(Fun(x0*1.01)-Fun(x0*.99))/(2*x0/100);
```

Command Window:

```
Part (a)
dxdy =
   5.0209

Part (b)
dxdy =
   0.7448
```

Problem 39

Script file:

```
disp('Part (a)')
[xnew,ynew] = rotation(6.5,2.1,25)
disp(' ')
disp('Part (b)')
x=5:.1:9;
y=(x-7).^2+1.5;
[xnew,ynew]=rotation(x,y,25);
plot(x,y,xnew,ynew,':')
title('rotation test')
legend('y=(x-7)^2+1.5','25 degree rotation')
xlabel('x-->')
ylabel('y-->')
axis([0 10 0 10])
```

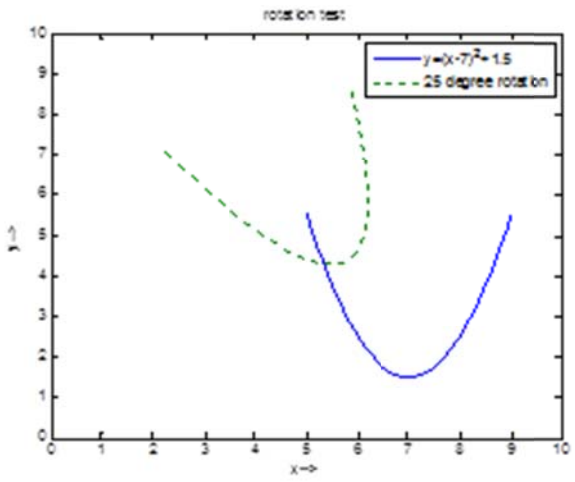
Function file:

```
function [xr,yr] = rotation(x,y,q)
xr=x*cosd(q) -y*sind(q);
yr=x*sind(q) + y*cosd(q);
```

Command Window:

```
Part (a)

xnew =

    5.0035

ynew =

    4.6503
```

Figure Window:



Problem 40

Script file:

```
disp('Part (a)')
prob3of6 = ProbLottery(3,6,49)
disp(' ')
disp('Part (b)')
num=0:6;
odds=ProbLottery(num,6,49);
tbl=[num;odds];
disp(' ')
disp(' Number')
disp(' Correct      Odds')
fprintf('   %1i      %.9f\n',tbl)
fprintf('\nCheck:  The sum of the probabilities is %.9f\n',sum(odd
```

Function files:

```
function P = ProbLottery(m,r,n)
P=Cxy(r,m).*Cxy(n-r,r-m)./Cxy(n,r);

function C = Cxy(x,y)
C=factorial(x)./(factorial(y).*factorial(x-y));
```

Command Window:

```
Part (a)
prob3of6 =
    0.0177

Part (b)

 Number
 Correct      Odds
   0      0.435964976
   1      0.413019450
   2      0.132378029
   3      0.017650404
   4      0.000968620
   5      0.000018450
   6      0.000000072

Check:  The sum of the probabilities is 1.000000000
```