```
% --------------------------------------------
% Data IO
% LiXin
% 2022/2/18
% --------------------------------------------
```

Problem 1

```
clear; close; clc;
```

(1)

```
syms x y a b z
eqn1=3*x^2+7*x*y+4==0
```

eqn1 = $3\,x^2 + 7\,y\,x + 4 = 0$

```
eqn2=a*y+b*x==z
```

eqn2 = $a\,y + b\,x = z$

```
eqn3=x-2*y+2*z==0
```

eqn3 = $x - 2\,y + 2\,z = 0$

(2)

```
eqn1_x=solve(eqn1)
```

eqn1_x =

$$\left(\begin{array}{c} -\dfrac{7\,y}{6} - \dfrac{\sqrt{49\,y^2 - 48}}{6} \\ \dfrac{\sqrt{49\,y^2 - 48}}{6} - \dfrac{7\,y}{6} \end{array}\right)$$

```
eqn2_x=solve(eqn2)
```

eqn2_x =

$$\dfrac{z - a\,y}{b}$$

```
eqn3_x=solve(eqn3)
```

eqn3_x = $2\,y - 2\,z$

(3)

```
S=solve([eqn1 eqn2 eqn3],x,y,z);
x=S.x
```

x =

$$\begin{pmatrix} -2\sqrt{2}\ \sqrt{\dfrac{1}{(a-1)\,(14\,b-6\,a+13)}}\ (a-1) \\[2em] 2\sqrt{2}\ \sqrt{\dfrac{1}{(a-1)\,(14\,b-6\,a+13)}}\ (a-1) \end{pmatrix}$$

```
y=S.y
```

y =

$$\begin{pmatrix} \sqrt{2}\ (2\,b+1)\ \sqrt{\dfrac{1}{(a-1)\,(14\,b-6\,a+13)}} \\[2em] -\sqrt{2}\ (2\,b+1)\ \sqrt{\dfrac{1}{(a-1)\,(14\,b-6\,a+13)}} \end{pmatrix}$$

```
z=S.z
```

z =

$$\begin{pmatrix} \sqrt{2}\ (a+2\,b)\ \sqrt{\dfrac{1}{(a-1)\,(14\,b-6\,a+13)}} \\[2em] -\sqrt{2}\ (a+2\,b)\ \sqrt{\dfrac{1}{(a-1)\,(14\,b-6\,a+13)}} \end{pmatrix}$$

(4)

```
a=4;
b=0.3;
S=subs(S);
x=S.x
```

x =

$$\begin{pmatrix} -\dfrac{\sqrt{2}\ \sqrt{5}\ \sqrt{102}\ \mathrm{i}}{17} \\[2em] \dfrac{\sqrt{2}\ \sqrt{5}\ \sqrt{102}\ \mathrm{i}}{17} \end{pmatrix}$$

```
y=S.y
```

y =

$$\begin{pmatrix} \dfrac{4\,\sqrt{2}\ \sqrt{5}\ \sqrt{102}\ \mathrm{i}}{255} \\[2em] -\dfrac{4\,\sqrt{2}\ \sqrt{5}\ \sqrt{102}\ \mathrm{i}}{255} \end{pmatrix}$$

```
z=S.z
```

z =

$$\begin{pmatrix} \dfrac{23\,\sqrt{2}\ \sqrt{5}\ \sqrt{102}\ \mathrm{i}}{510} \\[2em] -\dfrac{23\,\sqrt{2}\ \sqrt{5}\ \sqrt{102}\ \mathrm{i}}{510} \end{pmatrix}$$

(5)

```
x=double(x)
```

x = 2×1 complex
   0.0000 - 1.8787i
   0.0000 + 1.8787i

```
y=double(y)
```

y = 2×1 complex
   0.0000 + 0.5010i
   0.0000 - 0.5010i

```
z=double(z)
```

z = 2×1 complex
   0.0000 + 1.4403i
   0.0000 - 1.4403i

## Problem 2

```
clear; close; clc;
```

(1)

```
y=poly2sym([0.3 0 0 -3 4.1 -5])
```

y =

$$\frac{3\,x^5}{10} - 3\,x^2 + \frac{41\,x}{10} - 5$$

```
D1=diff(y,1)
```

D1 =

$$\frac{3\,x^4}{2} - 6\,x + \frac{41}{10}$$

```
D2=diff(y,2)
```

D2 = $6\,x^3 - 6$

```
I=int(y)
```

I =

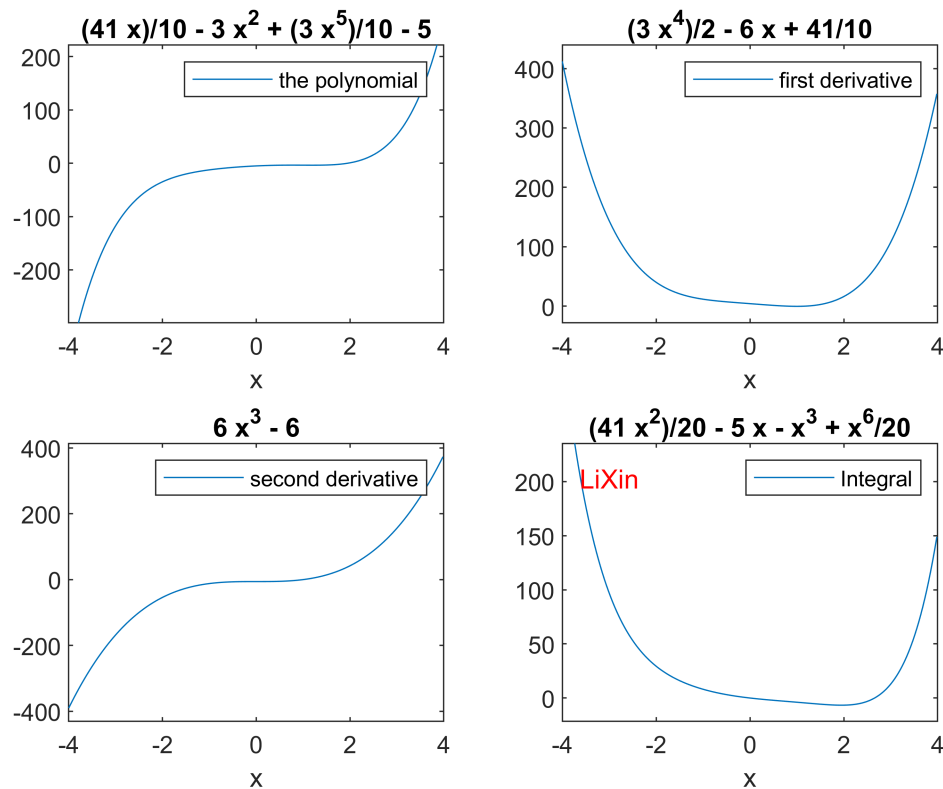$$\frac{x^6}{20} - x^3 + \frac{41\,x^2}{20} - 5\,x$$

(2)

```
figure
subplot(2,2,1)
ezplot(y,[-4 4]), legend('the polynomial')
subplot(2,2,2)
```

3

```matlab
ezplot(D1,[-4 4]), legend('first derivative')
subplot(2,2,3)
ezplot(D2,[-4 4]), legend('second derivative')
subplot(2,2,4)
ezplot(I, [-4 4]), legend('Integral')
```

(3)

```matlab
placeMyName(1)
```



Problem 3

```matlab
clear; close; clc;
```

(1)

```matlab
T=readtable('dotData.txt','Delimiter',',');
x=T.Var1;
y=T.Var2;
size=T.Var3;
```

(2)

```matlab
figure
for i = 1:length(x)
    if size(i) == 0.5
        rectangle('Position',[x(i) y(i) size(i) size(i)], 'Curvature',[1 1], 'FaceColor', 'red'
```

4

```
    else
        rectangle('Position',[x(i) y(i) size(i) size(i)], 'Curvature',[1 1], 'FaceColor', 'blac
    end
end
```

(3) ealge

(4)

```
set(gca, 'xtick', [])
set(gca, 'ytick', [])
```

(5)

```
placeMyName(1)
```

(6)

```
axis equal
```



(7)~(8)

already modified


Problem 4

```
clear; close; clc;
```

(1)

(a)

```
x=0:10:360
```

x = 1×37

    0    10    20    30    40    50    60    70    80    90   100   110   120 · · ·

(b)

```
y=sind(x)
```

y = 1×37

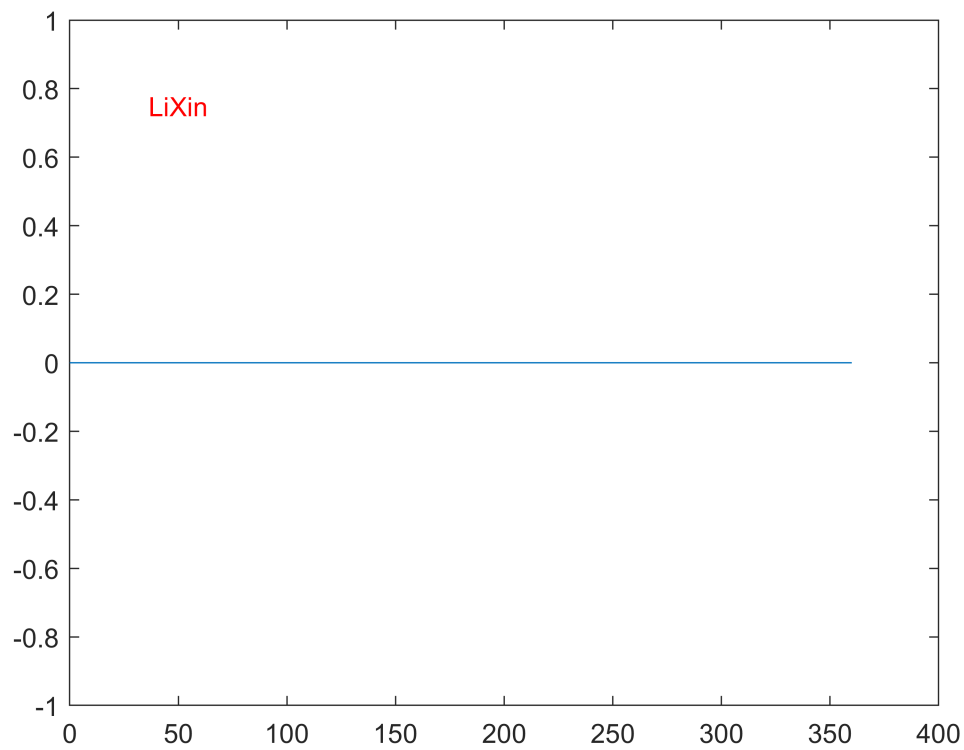    0    0.1736    0.3420    0.5000    0.6428    0.7660    0.8660    0.9397 · · ·

(c)

```
theta=0
```

theta = 0

(d)

```matlab
loops = 73;
M(loops) = struct('cdata',[],'colormap',[]);
i=1;
while true
    y_plot=y*sind(theta);
    plot(x,y_plot);
    ylim([-1 1])
    placeMyName(1);
    pause(0.1);
    M(i)=getframe;
    i=i+1;
    theta=theta+10;
    if theta > 720
        break;
    end
end
```
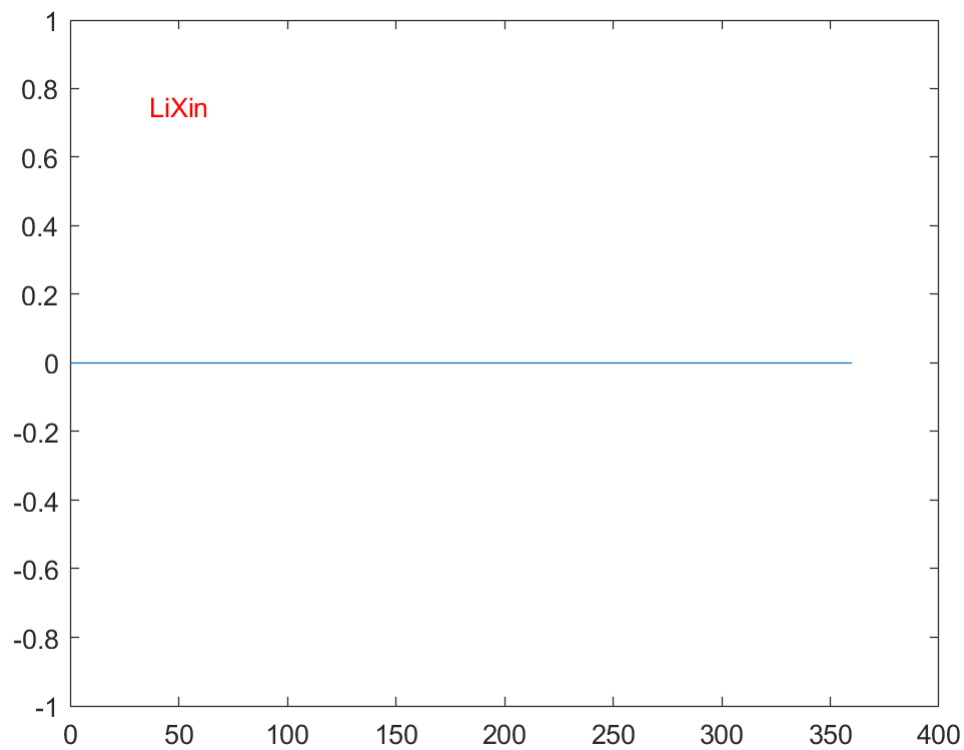
(2)

```
v1=VideoWriter('all.avi');
open(v1);
writeVideo(v1,M);
close(v1);
% write gif
fig=figure;
idx=1;
for theta = 0 : 10 : 90
    y_plot=y*sind(theta);
    plot(x,y_plot);
    ylim([-1 1])
    placeMyName(1);
    drawnow
    frame = getframe(fig);
    im{idx} = frame2im(frame);
    idx=idx+1;
end
```

```
nImages=10;
close;
filename = 'frames10.gif'; % Specify the output file name
for idx = 1:nImages
    [A,map] = rgb2ind(im{idx},256);
    if idx == 1
        imwrite(A,map,filename,'gif','LoopCount',Inf,'DelayTime',0.1);
    else
        imwrite(A,map,filename,'gif','WriteMode','append','DelayTime',0.1);
    end
end
```

Problem 5

```
clear; close; clc;
```

(1)

```
%num=input('enter a number between 20 and 100');
num=35;
```
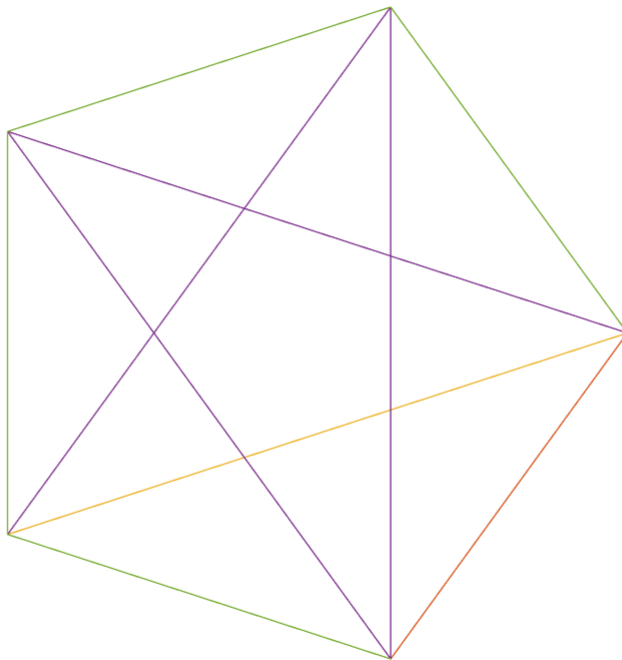
(2)

```
k=5;
flag=1; % forward
while true
    plot(fft(eye(k)));
```

```matlab
        axis([-1 1 -1 1])
        pause(0.05);
        if(flag)
            k=k+2;
        else
            k=k-2;
        end
        if(k > num)
            flag=0;
        end
        if(~flag && k < 5)
            break
        end
    end
end
axis equal
axis off
```



```matlab
function placeMyName(x)
    ax=gca;
    name='LiXin';
    x_interval=(ax.XLim(2)-ax.XLim(1))/8;
    y_interval=(ax.YLim(2)-ax.YLim(1))/8;
    switch x
        case 1 % upper left
            text(ax.XLim(1)+x_interval,ax.YLim(2)-y_interval,name,'HorizontalAlignment',"center
        case 2 % upper right
            text(ax.XLim(2)-x_interval,ax.YLim(2)-y_interval,name,'HorizontalAlignment',"center
```

```matlab
        case 3 % lower left
            text(ax.XLim(1)+x_interval,ax.YLim(1)+y_interval,name,'HorizontalAlignment',"cente
        case 4 % lower right
            text(ax.XLim(2)-x_interval,ax.YLim(1)+y_interval,name,'HorizontalAlignment',"cente
    end
end
```

```matlab
        case 3 % lower left
            text(ax.XLim(1)+x_interval,ax.YLim(1)+y_interval,name,'HorizontalAlignment',"cente
        case 4 % lower right
```