ID : 102062111, Name : Chih-Min Lin

1. (a)

   Matlab stands for "matrix" and "laboratory"

   (b)

   Matlab is created by "Cleve Moler"

   (c)

   C language is used to implement the original Matlab.

   (d)

   LAPACK is a numerical linear algrbra package used by Matlab currently.

   (e)

   Yes, Matlab support symbolic computing, such as "x = 10; y = x + 100"

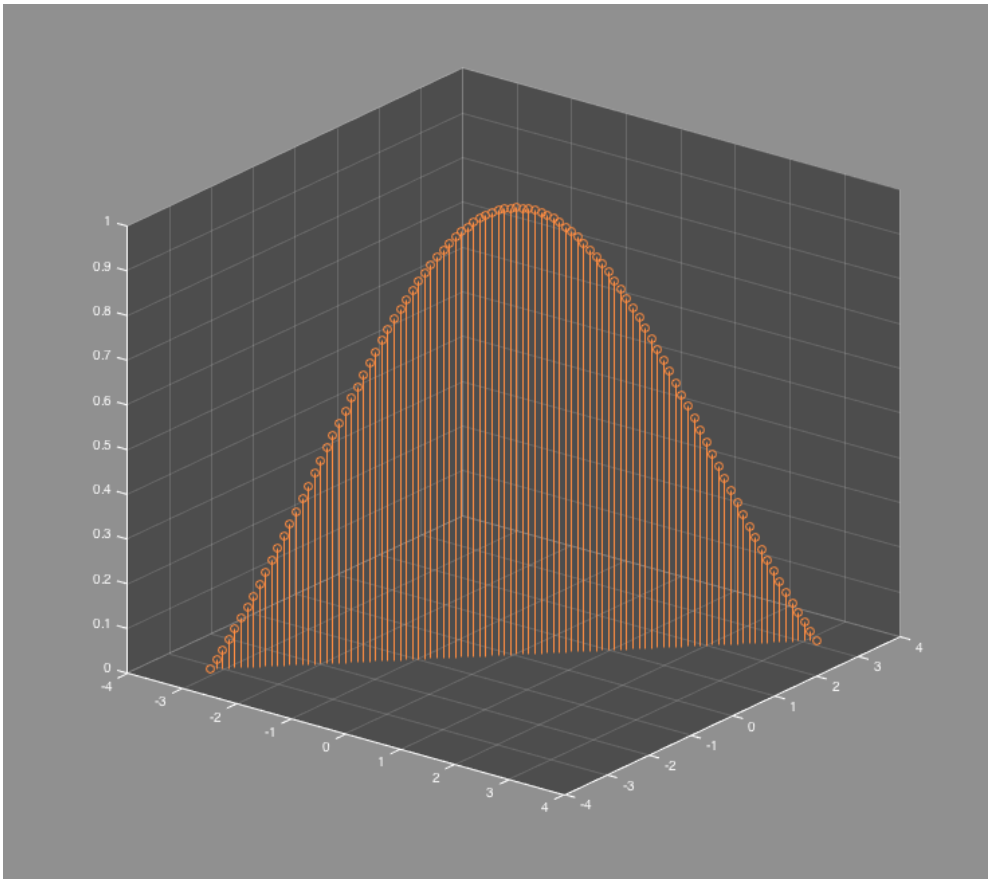
2. (a)

   A Bezier curve is a mathematically defined curve used in two-dimensional graphic applications. The curve is defined by four points: the initial position and the terminating position (which are called "anchors") and two separate middle points (which are called "handles"). The shape of a Bezier curve can be altered by moving the handles.

   (b)

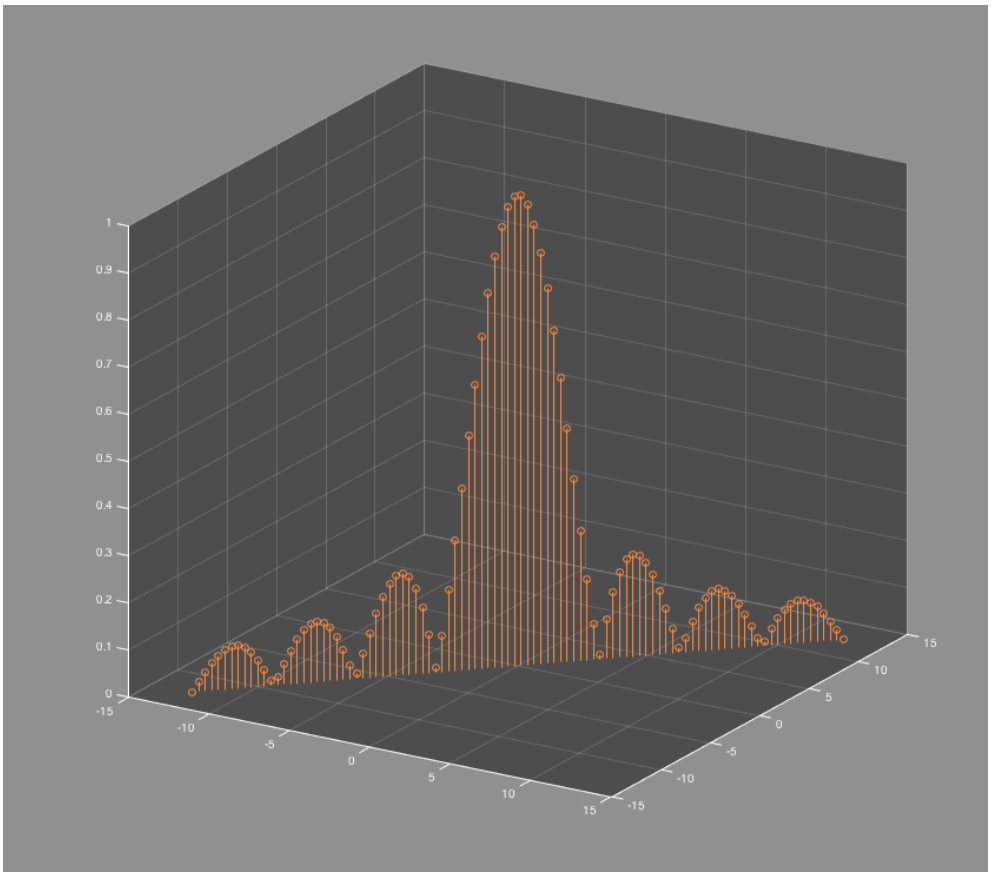
3. (a)

```
x = linspace(-pi, pi);
y = linspace(-pi, pi);
f = sin(x) ./ x
stem3(x, y, f)
```



(b)

```
x = linspace(-4 * pi, 4 * pi);
y = linspace(-4 * pi, 4 * pi);
z = abs(sin(x) ./ x);
stem3(x, y, z)
```



4. (a)

```
img = imread('58.jpg');
[h, w, color] = size(img)
B(1:color, w*h + 1) = 0;
for i = 1:color,
   for j = 1:w,
      for k = 1:h,
         B(i, (j-1) * h + k) = img(k, j, i);
      end
   end
end

B(:, 1:10)
```

Run result :

```
   249   245   251   245   251   255   240   248   251   245
   255   253   255   250   254   255   237   241   240   231
   255   255   255   246   247   246   222   223   218   205
```

(b)

```
YUV(1, :) = 0.299 * B(1,:) + 0.587 * B(2,:) + 0.114 * B(3,:);
YUV(2, :) = -0.147 * B(1,:) - 0.289 * B(2,:) + 0.436 * B(3,:);
YUV(3, :) = 0.615 * B(1,:) - 0.515 * B(2,:) - 0.1 * B(3,:);

for j = 1:w,
   for k = 1:h,
      Y(k, j) = B(1, (j-1) * h + k);
      U(k, j) = B(2, (j-1) * h + k);
      V(k, j) = B(3, (j-1) * h + k);
   end
end
imshow([Y, U, V]);
```

Origin picture :

Output picture :

6. (a)

$$\text{we knows that : } \frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$$

$$Y = y^2 = \alpha X + \beta = -\frac{b^2}{a^2}x^2 + b^2$$

$$a^2 = -\frac{\beta}{\alpha},\ b^2 = \beta$$

$$\textit{Original equation is } (x-a)^2 + (y-b)^2 = c^2 \textit{ is also equal to } \frac{(x-a)^2}{c^2} + \frac{(y-b)^2}{c^2} = 1$$

$$\because \text{We don't care about the offset of x and y corrdinate}$$

$$\therefore \textit{The linear equation is } y^2 = -\frac{c^2}{c^2}x^2 + c^2,\ Y = -X + c^2$$

(b)

$$\text{We know the linear equation of } y = \frac{ax}{x^2 + b^2} \textit{ is}$$

$$\frac{1}{y} = \frac{1}{a}x + \frac{b^2}{a}\frac{1}{x}$$

$$\textit{Let } Y = \frac{1}{y},\ \alpha = \frac{1}{a},\ \beta = \frac{b^2}{a}$$

$$\therefore Y = \alpha x + \beta\frac{1}{x}$$

(c)

$$\text{We know the linear equation of } \frac{x^2}{a^2} + \frac{y^2}{b^2} = 1 \textit{ is}$$

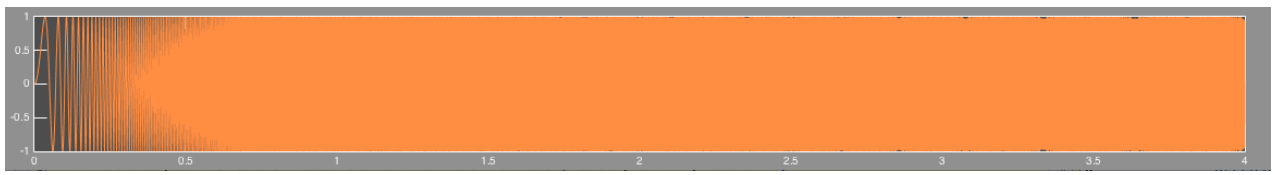
$$y^2 = -\frac{b^2}{a^2}x^2 + b^2$$

$$\textit{Let } Y = y^2,\ \alpha = -\frac{b^2}{a^2},\ \beta = b^2$$

$$\therefore Y = \alpha x^2 + \beta$$

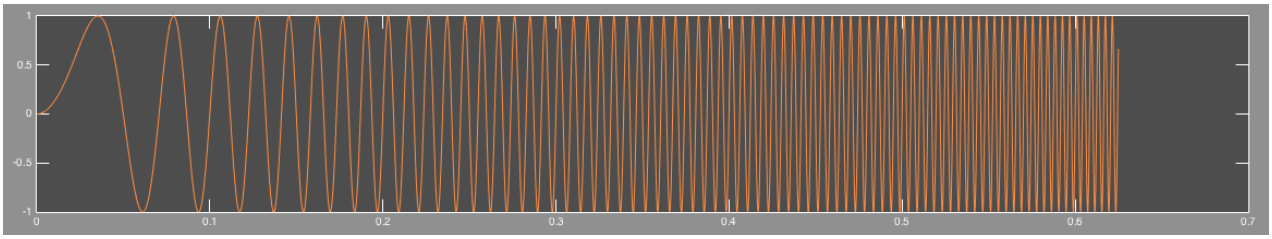
7. (a)

```
Fs=16000;
Ts=1/Fs;
t=[0:Ts:4];
[~, length] = size(t);

music = t;
step = length / 800;
for i = 1:length,
    hz = i / step;
  music(i) = sin(2 * pi * hz * t(i));
end

plot(t, music)
```



(b)

```
plot(t(1:10000), music(1:10000));
```



(c)

I think this is the same because we just up-side-down the value of y, and y is a sin function.