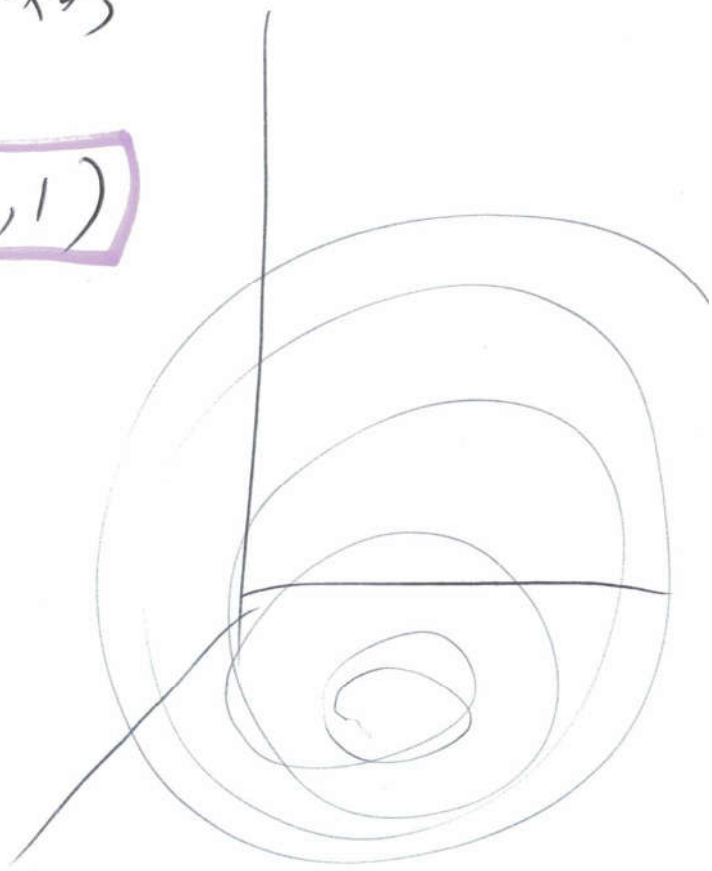
Lec 35 3-D Plot

① A 3-D Line

```
t = 0:0.1:6*pi;
x = sqrt(t).*sin(2*t);
y = sqrt(t).*cos(2*t);
z = 0.5*t;
plot3(x,y,z,'LineWidth',1)
grid on
xlabel('x');
ylabel('y');
zlabel('z');
```

(Try This)



② mesh — surface Plot : $z = f(x, y)$

x, and y are independent variables,

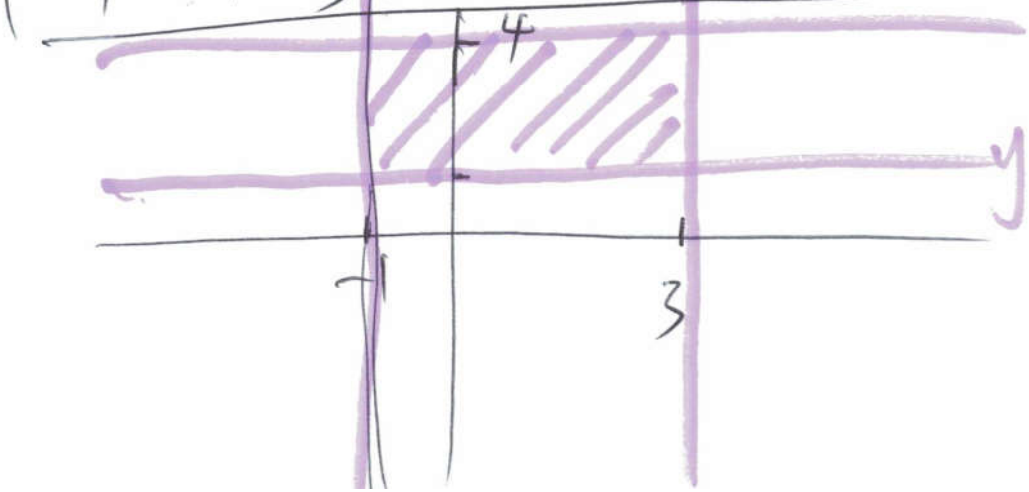
(z) is a dependent variable

step: 1). create a grid in the x-y plane, that contains the points.

2). Calculate the values of z at every point of the grid

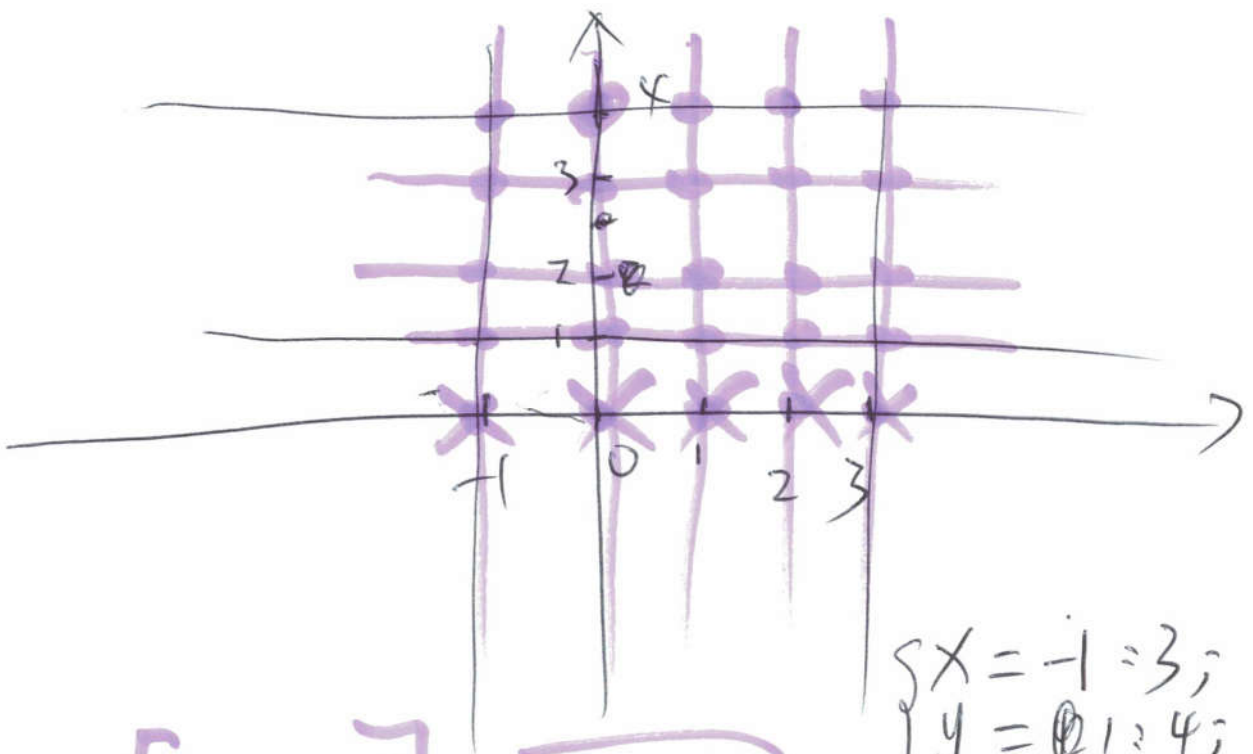
3) Make the Plot.

$-1 \le x \le 3$, $1 \le y \le 4$



$x = [-1\ 0\ 1\ 2\ 3]$

$y = [1\ 2\ 3\ 4]$

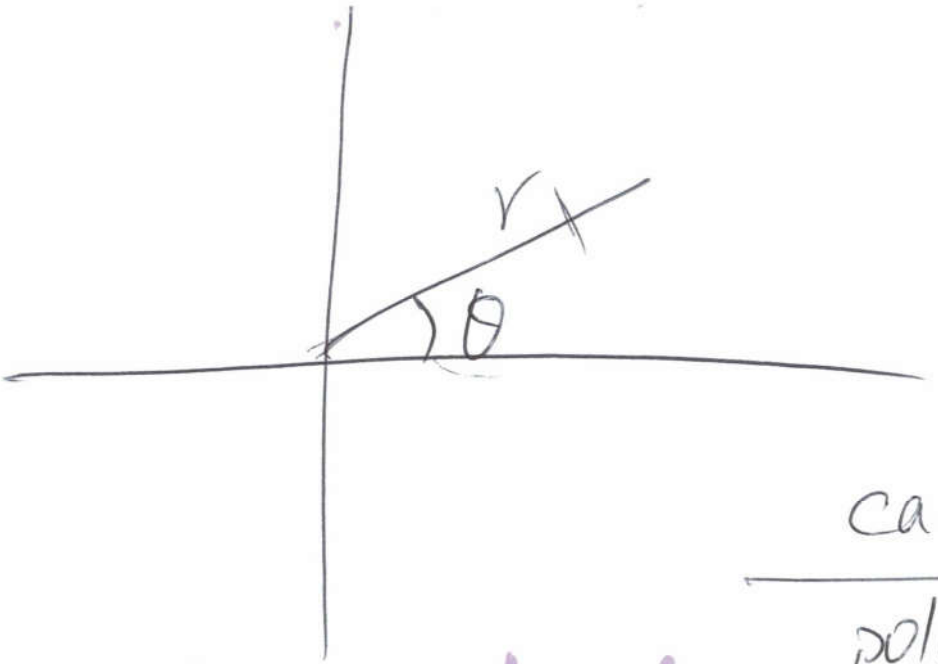


$$\begin{cases} x = -1:3; \\ y = 1:4; \end{cases}$$

$$[X, Y] = \text{meshgrid}(x, y)$$

$$X = \begin{bmatrix} -1 & 0 & 1 & 2 & 3 \\ -1 & 0 & 1 & 2 & 3 \\ -1 & 0 & 1 & 2 & 3 \\ -1 & 0 & 1 & 2 & 3 \end{bmatrix}$$

$$Y = \begin{bmatrix} 4 & 4 & 4 & 4 & 4 \\ 3 & 3 & 3 & 3 & 3 \\ 2 & 2 & 2 & 2 & 2 \\ 1 & 1 & 1 & 1 & 1 \end{bmatrix}$$



Polar Coordinate

cartesian coordinate

polar coordinate

$z = f(\theta, r)$

Example: $z = r\theta$ $\quad 0 \le \theta \le 360^\circ$

$0 \le r \le 2$

```
[th, r] = meshgrid((0:5:360)*pi/180, 0:0.1:2)
```

θ r

```
z = r.*th;
[X, Y] = pol2cart(th, r);
mesh(X, Y, z);
```

Try this