1.)   <u>**Graphing Vector Fields:**</u>

a.)   **U(x,yz) = <x,-y>**

[x,y]= meshgrid(-3:1:3,-3:1:3);
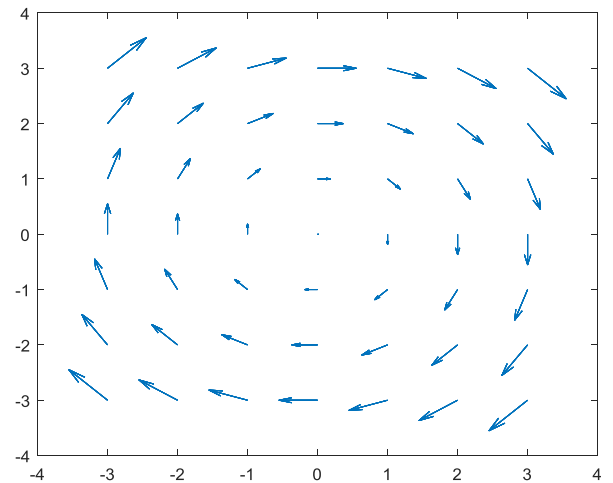
u = x;
v = -y;

figure
quiver(x,y,u,v)
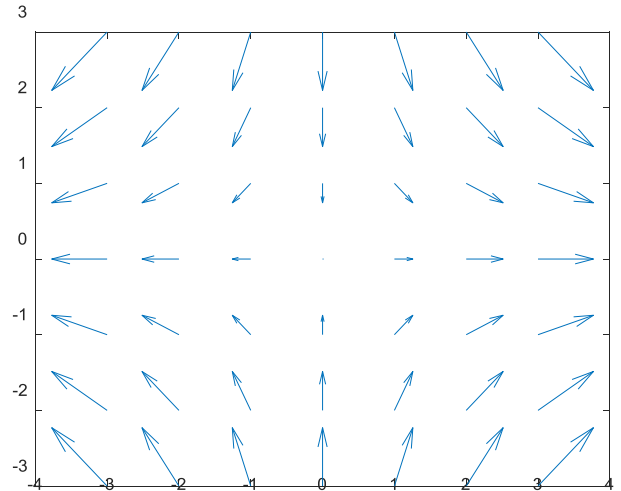
b.)   **V(x,y,z) = <y,-x>**

```
[x,y,z]= meshgrid(-3:1:3,-3:1:3,-3:1:3);

u = y;
v = -x;

figure
quiver(x,y,u,v)
```

c.) Calculate the divergence and curl of both vector fields above and plot by Matlab.

a.) Divergence: $\nabla \cdot \{x, -y, 0\} = 0$, | Curl: $\nabla \times \{x, -y, 0\} = <0,0,0>$
b.) Divergence: $\nabla \cdot \{y, -x, 0\} = 0$, | Curl: $\nabla \times \{y, -x, 0\} = <0,0,2>$

2.)   <u>**Graphing Curves:**</u> $x = 10\ \sin(5\ t) - 10,\ y = 10\ \cos(5\ t),\ z = 20\ t$

a.) **A helix located at the origin has a radius of 10 m and rises at a speed of 20m.**
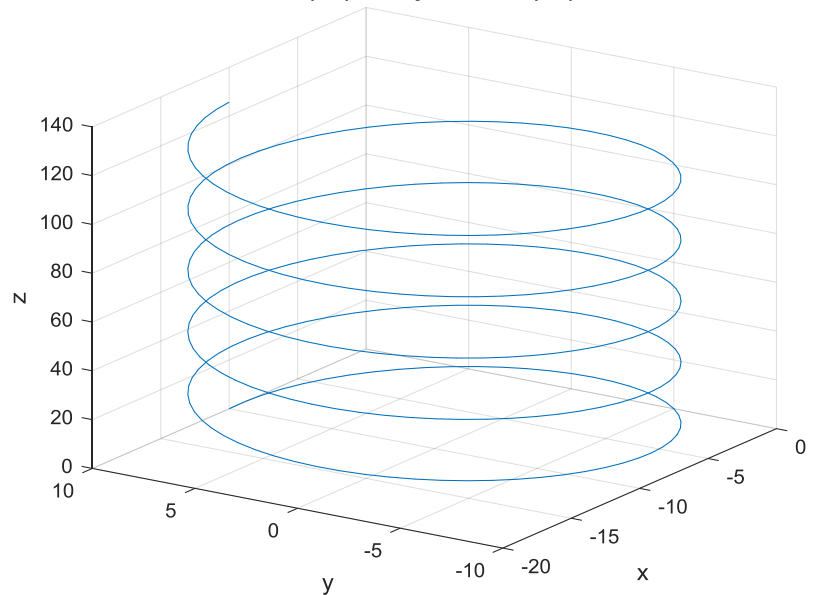
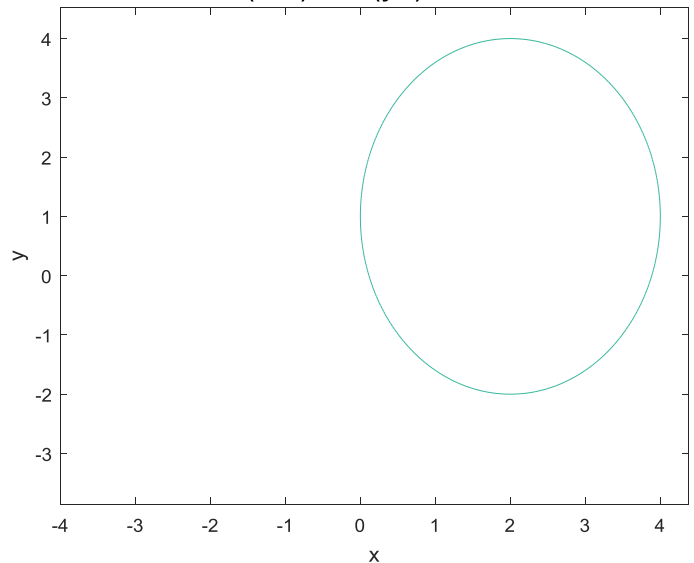Matlab Code:

ezplot3(10*sin(5*t)10,10*cos(5*t),z,[0,2*pi])

b.) **An ellipse located at point (2,1) and has a radius of 2 m on x axis and 3 m on y axis.**

Matlab Code:

ezplot('(x - 2)^2/2^2 + (y-1)^2/3^2 = 1');

$(x - 2)^2/2^2 + (y-1)^2/3^2 = 1$

3.)   <u>**Graphing surfaces:**</u>

   $x = 5 \sin(u) \cos(v), y = 5 \sin(u) \sin(v), z = 5 \cos(u)$

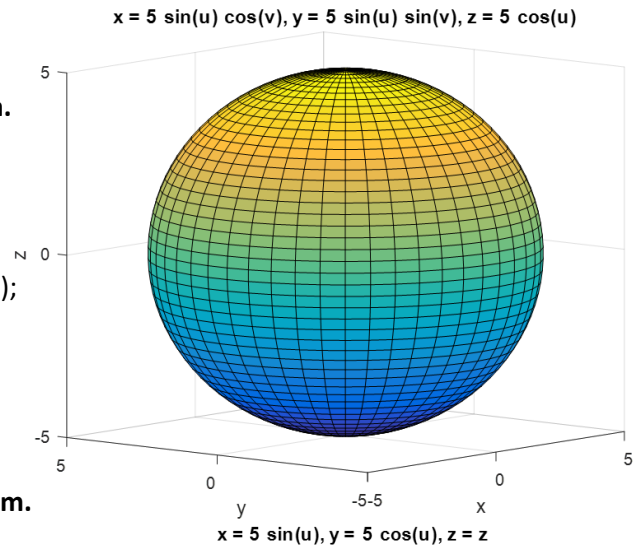   **a.) A sphere located at the origin, has a radius of 5m.**

   Matlab Code:

   figure

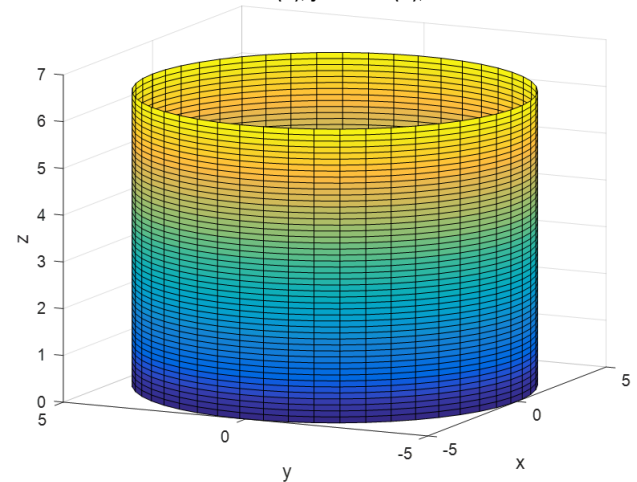   ezsurf('5*sin(u)*cos(v)','5*sin(u)*sin(v)','5*cos(u)',[0 pi, 0 2*pi]);

   b.) A cylinder located at the origin, has a radius of 5 m.

   $x = 5 \sin(u), y = 5 \cos(u), z = z$

   Matlab code:

   figure

   ezsurf('5*sin(u)','5*cos(u)','z',[0 2*pi]);

   c.) A cone located at the origin has a floor radius of 5 m, and height of 5 m. The tip of the cone touches the origin.

   Matlab code:

   figure

   ezsurf('5*cos(u)*v','5*sin(u)*v','5*v',[0 2*pi 0 1]);

   $x = 5 \cos(u) \, v, y = 5 \sin(u) \, v, z = 5 \, v$

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