

Scatter Plot

Construct a scatter plot. State if there appears to be a positive correlation, negative correlation, or no correlation. When there is a correlation, identify the relationship as linear, quadratic, or exponential.

1)

X	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
Y	1300	1500	2000	2000	2400	2500	3600	3700	4200	5200

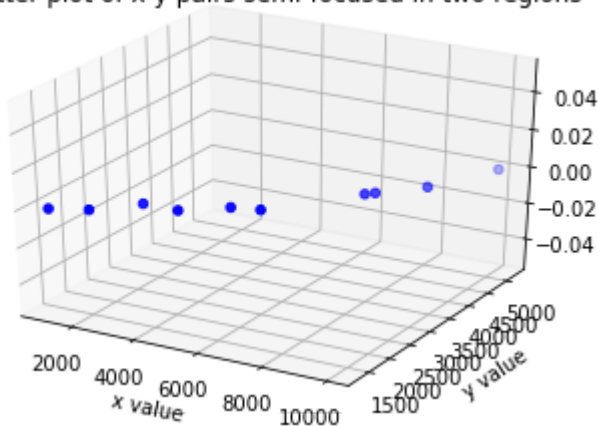
In [29]:

```

1 from mpl_toolkits import mplot3d
2 from matplotlib.pyplot import *
3 from numpy import *
4
5 ax = axes(projection='3d')
6 # if using a Jupyter notebook, include:
7
8 x1 = [1000,2000,3000,4100,5200,6000,7800,8000,9000,10000]
9 y1=[1300,1500,2000,2000,2400,2500,3600,3700,4200,5200]
10 x2=[140,150,170,180,270,280,450,450,770,910]
11 y2=[500,1000,300,100,200,900,500,500,400,600]
12 colors = np.random.rand(1502)
13
14
15 ax.scatter3D(x1 ,y1,color='blue')
16 ax.set_title('Scatter plot of x-y pairs semi-focused in two regions')
17 ax.set_xlabel('x value')
18 ax.set_ylabel('y value')
19
20
21 plt.show()

```

Scatter plot of x-y pairs semi-focused in two regions

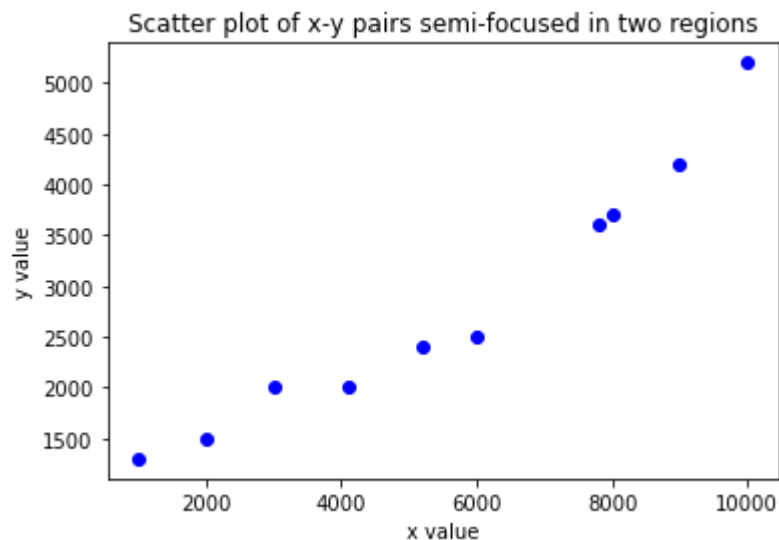


In [47]:

```

1 from mpl_toolkits import mplot3d
2 from matplotlib.pyplot import *
3 from numpy import *
4
5 ax = plt.axes()
6 # if using a Jupyter notebook, include:
7
8 x1 = [1000,2000,3000,4100,5200,6000,7800,8000,9000,10000]
9 y1=[1300,1500,2000,2000,2400,2500,3600,3700,4200,5200]
10 x2=[140,150,170,180,270,280,450,450,770,910]
11 y2=[500,1000,300,100,200,900,500,500,400,600]
12 colors = np.random.rand(1502)
13
14
15 ax.scatter(x1 ,y1,color='blue')
16 ax.set_title('Scatter plot of x-y pairs semi-focused in two regions')
17 ax.set_xlabel('x value')
18 ax.set_ylabel('y value')
19
20
21 plt.show()

```



There is a positive linear correlation in the given data.

2)

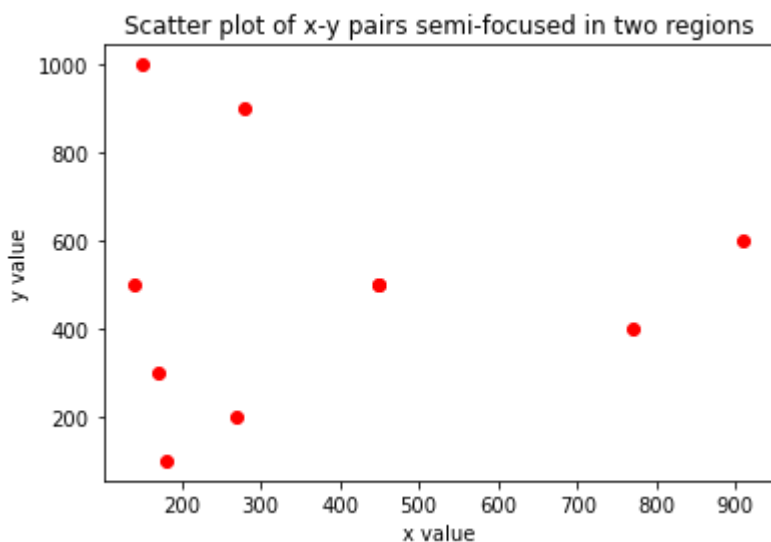
X	140	150	170	180	270	280	450	450	770	910
Y	500	1000	300	100	200	900	500	500	400	600

In [45]:

```

1 from mpl_toolkits import mplot3d
2 from matplotlib.pyplot import *
3 from numpy import *
4
5 ax=axes(projection='3d')#3d Plot
6 ax=plt.axes()#2d plot
7 # if uising a Jupyter notebook, include:
8
9 x2=[140,150,170,180,270,280,450,450,770,910]
10 y2=[500,1000,300,100,200,900,500,500,400,600]
11
12
13 p1=ax1.scatter3D(x2,y2,color='blue')
14 p2=ax.scatter(x2 ,y2,color='red')
15 ax.set_title('Scatter plot of x-y pairs semi-focused in two regions')
16 ax.set_xlabel('x value')
17 ax.set_ylabel('y value')
18
19
20 plt.show()

```



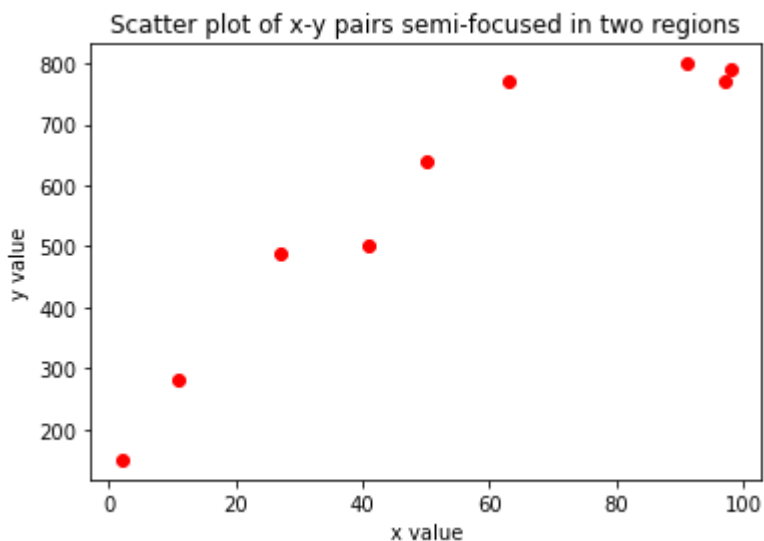
There is no correlation found in the given data.

3)

X	2	11	27	27	41	50	63	91	97	98
Y	150	280	490	500	640	680	770	800	770	790

In [34]:

```
1 from mpl_toolkits import mplot3d
2 from matplotlib.pyplot import *
3 from numpy import *
4
5 ax = plt.axes()
6 # if using a Jupyter notebook, include:
7
8 x3=[2,11,27,41,50,63,91,97,98]
9 y3=[150,280,490,500,640,770,800,770,790]
10
11
12
13 ax.scatter(x3 ,y3,color='red')
14 ax.set_title('Scatter plot of x-y pairs semi-focused in two regions')
15 ax.set_xlabel('x value')
16 ax.set_ylabel('y value')
17
18
19 plt.show()
```



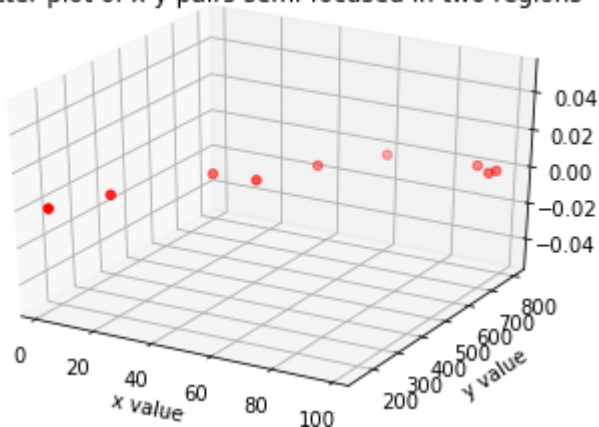
In [46]:

```

1 from mpl_toolkits import mplot3d
2 from matplotlib.pyplot import *
3 from numpy import *
4
5 ax = axes(projection='3d')
6 # if using a Jupyter notebook, include:
7
8 x3=[2,11,27,41,50,63,91,97,98]
9 y3=[150,280,490,500,640,770,800,770,790]
10
11
12
13 ax.scatter3D(x3 ,y3,color='red')
14 ax.set_title('Scatter plot of x-y pairs semi-focused in two regions')
15 ax.set_xlabel('x value')
16 ax.set_ylabel('y value')
17
18
19 plt.show()

```

Scatter plot of x-y pairs semi-focused in two regions



There is a positive exponential correlation among the given data.

Vector Plots

In [48]:

```

1 from numpy import *
2 import matplotlib.pyplot as plt

```

1) Write a program to obtain a vector plot for

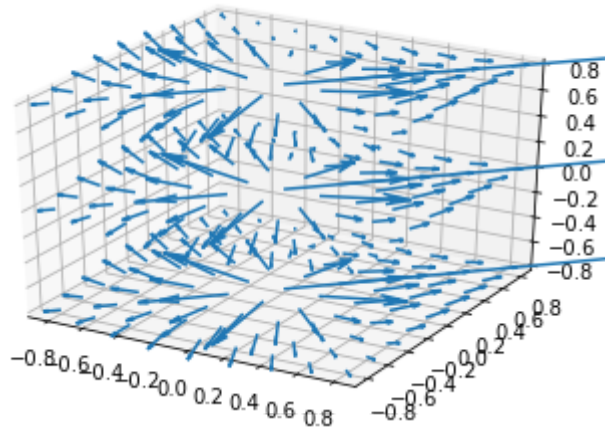
$$u = \frac{x}{x^2+y^2}, v = \frac{y}{x^2+y^2}, w = \frac{x^2}{x^2+y^2} - \frac{y^2}{x^2+y^2}$$

In [53]:

```

1 fig=figure()
2 ax=fig.gca(projection='3d')
3 x,y,z=meshgrid(arange(-0.8,1,0.2),
4                 arange(-0.8,1,0.2),
5                 arange(-0.8,1,0.8))
6 u=(x)/(x**2+y**2)
7 v=(y)/(x**2+y**2)
8 w=(x**2)/(x**2+y**2)-(y**2)/(x**2+y**2)
9 ax.quiver(x,y,z,u,v,w,length=0.1)
10 show()

```



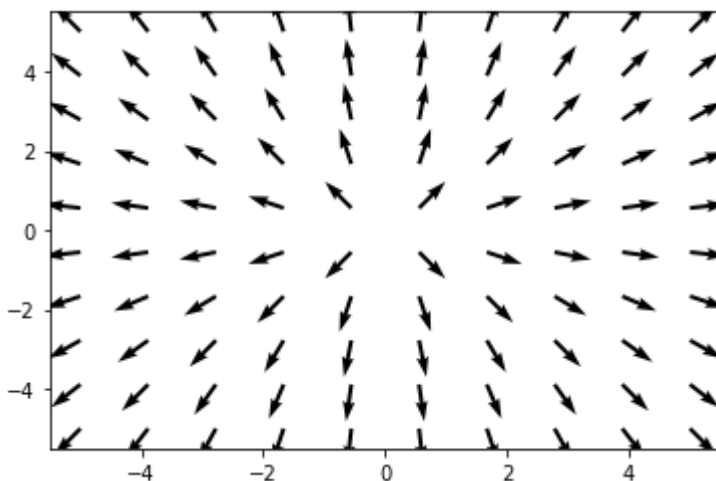
1 **### Write a program to obtain a vector plot of $u=\frac{x}{\sqrt{x^2+y^2}}$ and $v=\frac{y}{\sqrt{x^2+y^2}}$**

In [54]:

```

1 x,y = meshgrid(linspace(-5,5,10),linspace(-5,5,10))
2 u = x/sqrt(x**2 + y**2)
3 v = y/sqrt(x**2 + y**2)
4 plt.quiver(x,y,u,v)
5 plt.show()

```

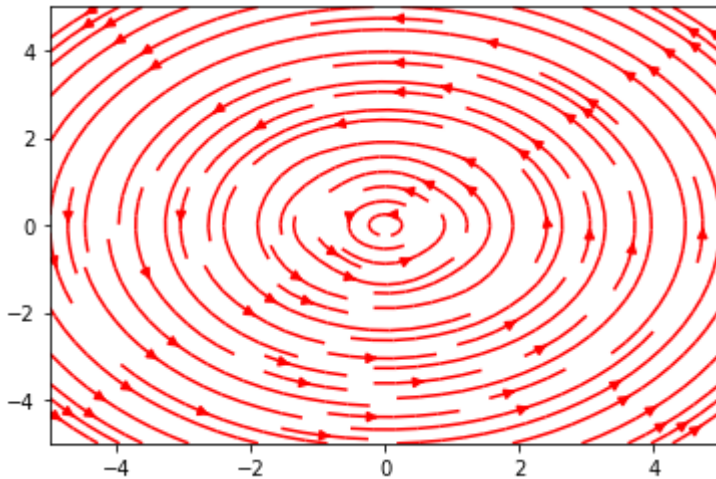


Stream Plot

Write a program to obtain a stream plot of $u = \frac{-y}{\sqrt{x^2+y^2}}$ and $v = \frac{x}{x^2+y^2}$

In [55]:

```
1 x,y = meshgrid(linspace(-5,5,10),linspace(-5,5,10))
2 u = -y/(x**2 + y**2)
3 v = x/(x**2 + y**2)
4 plt.streamplot(x,y,u,v,color= 'Red',density=1,cmap='copper',arrowsize=1)
5 plt.show()
```



Exercise:

- Write python program to obtain a three dimensional scatter plot of $x = 2\sin(z)$ and $y = 2\cos(z)$.
- Obtain the stream plot of $\vec{F}(x, y) = -\frac{y}{\sqrt{x^2+y^2}}\mathbf{i} + \frac{x}{\sqrt{x^2+y^2}}\mathbf{j}$
- Write a Python program to obtain a vector plot of $F = [2x\sin(2y) - 3y^2]\mathbf{i} + (2 - 6xy + 2x^2\cos(2y))\mathbf{j}$

In []:

1