In [1]:

```
# Practical no.7: 2D Transformation
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```

In [2]:

```
#Q1)Rotate the line passing through the points A[1,1] and B[5,5] about origin through an
#angle of 90 degree.
```

In [3]:

```
from sympy import *
from math import *
L=Line((1,1),(5,5))
L.rotate(pi/2)
```

Out[3]:

$$\text{Line2D}(\text{Point2D}(-1, 1), \text{Point2D}(-5, 5))$$

In [4]:

```
#Q2)If the line segment joining the points A[2,5],B[4,-13] is transformed to the line seg
#by the transformation matrix,T([2,3],[4,1]),then find  the midpoint of the A*B*.
```

In [5]:

```
A=Point(2,5)
B=Point(4,-13)
A1=A.transform(Matrix([[2,3,0],[4,1,0],[0,0,1]]))
B1=B.transform(Matrix([[2,3,0],[4,1,0],[0,0,1]]))
L=Segment(A1,B1)
L.midpoint
```

Out[5]:

$$\text{Point2D}(-10, 5)$$

In [6]:

```
#Q3)Reflect  the line segment joining the points A[5,3] and B[1,4] through the line y=x+1
```

In [7]:

```
x,y=symbols('x,y')
A=Point(5,3)
B=Point(1,4)
S=Segment(A,B)
S.reflect(Line(x-y+1))
```

Out[7]:

$$\text{Segment2D}(\text{Point2D}(2, 6), \text{Point2D}(3, 2))$$

In [8]:

```
#Q4)Suppose that the line segment between the points A(1,4) and B(3,6) is transformed to
#segment A*B* using the transformation matrix T=([2,-1],[1,3]).Find slope of the transfor
#segment A*B*.
```

In [10]:

```
A=Point(1,4)
B=Point(3,6)
A1=A.transform(Matrix([[2,-1,0],[1,3,0],[0,0,1]]))
B1=B.transform(Matrix([[2,-1,0],[1,3,0],[0,0,1]]))
L=Segment(A1,B1)
L.slope
```

Out[10]:

$$\frac{2}{3}$$

In [11]:

```
#Q5)If the two lines  2x-y=5 and x+3y=-1 are transformed using the transformation matrix
#T=([-2,3],[1,1]) then find the point of intersection of the transformed lines.
```

In [14]:

```
x,y=symbols('x,y')
l1=Line(2*x-y-5)
l2=Line(x+3*y+1)
p=l1.intersection(l2)
p=p[0]
p.transform(Matrix([[-2,3,0],[1,1,0],[0,0,1]]))
```

Out[14]:

$$\text{Point2D}(-5, 5)$$

In [15]:

```
#Q6)If we apply shearing on the line 2x+y=3 in x and y directions by 2 and -3 units respe
#then find equation of the resulting line.
```

In [16]:

```
x,y=symbols('x,y')
l=Line(2*x+y-3)
points=l.points
p=points[0]
q=points[1]
p1=p.transform(Matrix([[1,-3,0],[2,1,0],[0,0,1]]))
q1=q.transform(Matrix([[1,-3,0],[2,1,0],[0,0,1]]))
l1=Line(p1,q1)
l1.equation()
```

Out[16]:

$$5x - 3y - 21$$

In [17]:

```
#Q7)If a 2x2 transformation matrix T=([1,3],[-2,2]) is used to transform a line L, then t
#of transformed line is y*=x*+4.Find the equation of the original line.
```

In [19]:

```
x,y=symbols('x,y')
l=Line(x-y+4)
points=l.points
p=points[0]
q=points[1]
M=Matrix(([[1,3,0],[-2,2,0],[0,0,1]]))
N=M.inv()
p1=p.transform(N)
q1=q.transform(N)
l1=Line(p1,q1)
l1.equation()
```

Out[19]:

$$\frac{x}{4}+\frac{y}{2}-\frac{1}{2}$$

In [20]:

```
#Q8)Find the combined  transformation of the line segment between the points A(4,-1) and
#the following sequence of the transformations: first rotation about origin through an an
#;followed by scaling in x coordinate by 3 units;followed by reflection through the line
```

In [21]:

```
A=Point(4,-1)
B=Point(3,0)
S=Segment(A,B)
S=S.rotate(pi)
S=S.scale(3,0)
points=S.points
p=points[0]
q=points[1]
p1=p.transform(Matrix([[0,1,0],[1,0,0],[0,0,1]]))
q1=q.transform(Matrix([[0,1,0],[1,0,0],[0,0,1]]))
Segment(p1,q1)
```

Out[21]:

$$\text{Segment2D}(\text{Point2D}(0, -12), \text{Point2D}(0, -9))$$

In [ ]: