Question 01 (Vectors)

What are (a) the x component and (b) the y component of vector m in xy plane if its direction is 250° counterclockwise from the positive direction of the x axis and its magnitude is 7.2 m?

In [1]:
```
import math
import matplotlib.pyplot as plt
import numpy as np
import sympy
import sympy.vector
from sympy.vector.vector.Vector
print(sympy.vector.vector.Vector)
print("The magnitude of the component (x",sympy,"and the magnitude of the y-component (x",sympy
)
# m.ga.axis(x)
# m.ga.axis(y)
# m.ga.axis(z)
# m.ga.axis(x+y+z)
Mag_m = ga.axis(x+y+z)
Mag_m = ga.axis(x+y+z,axis = 'x', unit=u'yr', ansi=True, ?)
Mag_m = ga.axis(x+y+z,axis = 'y', unit=u'yr', ansi=True, ?)

Array.append(
Array.append(
Array.append(x,axis = 'x', unit=u'yr', ansi=True, ?)
Array.append(
Array.append(y,axis = 'y', unit=u'yr', ansi=True, ?)

Array.sort()
print(
ga.set_aspect("equal")
plt.grid(
plt.xlim(-1,1)
plt.ylim(-1,1)
plt.xticks(
plt.yticks(
plt.xlabel("x")
plt.ylabel("y")
plt.title("Vector and its components representation")
```

```
The magnitude of the component (x (FF6F7FD2C7F3F and the magnitude of the y-component (x (FF6F7FD2C7F3F)
```

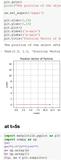
Out[1]: Text(0.0, 1.0, 'Vector and its components representation')

Question 02 (Dot product and Cross Product)

Two vectors are presented as a=3i+3j b=2i+4j. Find a.b

In [2]:
```
import math
import matplotlib.pyplot as plt
import numpy as np
import sympy
Array.append(x,y)
print("The dot product of the given vectors (",Arr)
print(Array)
Mr.ga.axis(x)
Mr.ga.axis(y)
# m.ga.axis(z)

Fin, dm = ga.axis(x,y)
Mag_m = ga.axis(x,y,axis = 'x', unit=u'yr', ansi=True)
Mag_m = ga.axis(x,y,axis = 'y', unit=u'yr', ansi=True)
plt.grid(?)

ga.set_aspect("equal")

plt.xlim(-1,1)
plt.ylim(-1,1)
plt.xticks(
plt.yticks(
plt.xlabel("x")
plt.ylabel("y")
plt.title("Representation of Vector A and B")

The dot product of the given vectors (4
```

Out[2]: Text(0.0, 1.0, 'Vector Representation of Vector A and B')



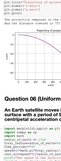
Question 03 (Motion in 1D)

The position of an object moving along an x axis is given by x=3t-4t²+2t³, where x is in meters and t in seconds. Find the position of the object at the following values of t: (a) t= 4 (b) t= 5

at t=4s

In [3]:
```
import matplotlib.pyplot as plt
import numpy as np
import math
ga.axis(x)
ga.axis(y)
ga.axis(z)
ga.axis(x+y+z)
Mag = ga.axis(x,y,axis = 'x', unit=u'yr', ansi=True)
Mag = ga.axis(x,y,axis = 'y', unit=u'yr', ansi=True)
print(The position of the object after t= (x,"s")

ga.set_aspect("equal")

plt.xlim(-1,1)
plt.ylim(-1,1)
plt.xticks(
plt.yticks(
plt.xlabel("x")
plt.ylabel("y")
plt.title("Position Vector of Particle")

The position of the object after t= (x s
```

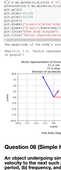
Out[3]: Text(0.0, 1.0, 'Position Vector of Particle')



at t=5s

In [4]:
```
import matplotlib.pyplot as plt
import numpy as np
import math
ga.axis(x)
ga.axis(y)
ga.axis(z)
ga.axis(x+y+z)
Mag = ga.axis(x,y,axis = 'x', unit=u'yr', ansi=True)
Mag = ga.axis(x,y,axis = 'y', unit=u'yr', ansi=True)
print(The position of the object after t= (x,"s")

plt.grid(?)
plt.xlim(-1,1)
plt.ylim(-1,1)
plt.xticks(
plt.yticks(
plt.xlabel("x")
plt.ylabel("y")
plt.title("Position Vector of Particle")

The position of the object after t= (x s
```

Out[4]: Text(0.0, 1.0, 'Position Vector of Particle')



Question 04 (Motion in 2D)

The floor of a railroad flatcar is loaded with loose crates having a coefficient of static friction of 0.20 with the floor. If the train is initially moving at a speed of 48 km/h, in how short a distance can the train be stopped at constant acceleration without causing the crates to slide over the floor?

In [5]:
```
Mass=20
Coefficient=0.20
Mass
acceleration=9.81
print("The distance which the train will stop (",distance,"m")

The distance when which the train will stop is 36.2017136363636 m
```

Question 05 (Projectile Motion)

A projectile is fired horizontally from a gun that is 45.0 m above flat ground, emerging from the gun with a speed of 250 m/s. (a) How long does the projectile remain in the air?(b) At what horizontal distance from the firing point does it strike the ground?

In [6]:
```
import matplotlib.pyplot as plt
import numpy as np
import math

Height
Velocity
Gravity
Height
acceleration.(acceleration)
Time_of_flight=(2*Velocity)/Gravity
timeing.append(x,y,z,t)
Distance=Velocity*Time_of_flight
print("The time remained in the air for","calculated the distance covered (x",distance,"m")
print(x,y,z,t)
print("The time remained in the air for","calculated the distance covered (x",distance,"m")
Time = plt.ga(x,y,z,t)
# m.ga.axis(x)
# m.ga.axis(y)
# m.ga.axis(z)
# m.ga.axis(x+y+z)
Mag = ga.axis(x,y,axis = 'x', unit=u'yr', ansi=True)
Mag = ga.axis(x,y,axis = 'y', unit=u'yr', ansi=True)
print("The time remained in the air for (",Time,"s")
print("Distance covered (x",distance,"m")
plt.grid(?)
plt.xlim(-1,1)
plt.ylim(-1,1)
plt.xticks(
plt.yticks(
plt.xlabel("x")
plt.ylabel("y")
plt.title("Projectile Motion")

The projectile remained in the air for 0.5304750349065850 sec
And the distance covered is 797.4349462431 m
```

Out[6]: Text(0.0, 1.0, 'Projectile Motion')

Question 06 (Uniform Circular Motion)

An Earth satellite moves in a circular orbit 640 km (uniform circular motion) above Earth's surface with a period of 99.0 min. What are (a) the speed and (b) the magnitude of the centripetal acceleration of the satellite?

In [7]:
```
import matplotlib.pyplot as plt
import math as np
import numpy as np
Orbital_Radius=640
Period=99.0
speed=(2*math.pi)/Orbital_Period
speed=speed*Orbital_Radius
print("The speed of the satellite (",speed,"m/s)and the magnitude of the centripetal acceleration is",cent_acc,"m/s
print("The speed of the satellite (",Orbital_Radius,"m/s)and the
Fin, dm = plt.ga(x,y)
# m.ga.axis(x)
# m.ga.axis(y)
# m.ga.axis(z)
# m.ga.axis(x+y+z)
Mag = ga.axis(x,y,axis = 'x', unit=u'yr', ansi=True)
Mag = ga.axis(x,y,axis = 'y', unit=u'yr', ansi=True)
print("The speed of the satellite (m/s)")
plt.grid(?)
plt.xlim(-1,1)
plt.ylim(-1,1)
plt.xticks(
plt.yticks(
plt.xlabel("x")
plt.ylabel("y")
plt.title("Circular motion of the satellite (m/s)")

The speed of the satellite is 7400.0952380952 m/s
And the magnitude of the centripetal acceleration is 0.8588462127024 m/s²
```

Out[7]: Text(0.0, 1.0, 'Circular motion of the satellite (m/s)')

Question 07 (Newton's laws)

Only two horizontal forces act on a 3.0 kg body that can move over a frictionless floor. One force is 9.0 N, acting due east, and the other is 6.0 N, acting 62 degree north of west.What is the magnitude of the body's acceleration?

In [8]:
```
import matplotlib.pyplot as plt
import math
import numpy
import sympy
import matplotlib.pyplot as plt
import numpy as np
import matplotlib.pyplot
print("The magnitude of the body's acceleration (x",length,"m/s²")
# m.ga.axis(x)
# m.ga.axis(y)
# m.ga.axis(z)
# m.ga.axis(x+y+z)
Mag = ga.axis(x,y,axis = 'x', unit=u'yr', ansi=True)
Mag = ga.axis(x,y,axis = 'y', unit=u'yr', ansi=True)
# m.ga.axis(x+y+z)
# m.ga.axis(x,y,axis = 'x', unit=u'yr', ansi=True)
# m.ga.axis(x,y,axis = 'y', unit=u'yr', ansi=True)
Acceleration = ga.axis(x,y,axis = 'x', unit=u'yr', ansi=True)
Acceleration = ga.axis(x,y,axis = 'y', unit=u'yr', ansi=True)
plt.grid(?)
plt.xlim(-1,1)
plt.ylim(-1,1)
plt.xticks(
plt.yticks(
plt.xlabel("x")
plt.ylabel("y")
plt.title("Acceleration body diagram",fontsize=5)

The magnitude of the body's acceleration is 2.0000000000000 m/s²
```

Out[8]: Text(0.0, 1.0, 'Acceleration body diagram')

Question 08 (Simple Harmonic Motion)

An object undergoing simple harmonic motion takes 0.25 s to travel from one point of zero velocity to the next such point. The distance between those points is 36 cm. Calculate the (a) period, (b) frequency, and (c) amplitude of the motion.

In [9]:
```
import math
import numpy as np
import sympy
import sympy.vector
import matplotlib.pyplot
import numpy
print("The total period (",Time_period,"s)The frequency (",frequency,"Hz)the amplitude (x",amplitude,"m")
# m.ga.axis(x)
# m.ga.axis(y)
# m.ga.axis(z)
# m.ga.axis(x+y+z)
def Simplegraph(Time,m,time,
    plt.plot(Time,m,time,
    return Time
Time_period=0.25
Time_period=Time_period*2
print("The total period (",Time_period,"s)The frequency (",frequency,"Hz)the amplitude (x",amplitude,"m")
amplitude=0.36
amplitude=amplitude/2
def Simplegraph(Time,m,time,
    plt.plot(Time,m,time,
    return Time
Time_period=0.25
Time_period=Time_period*2
frequency=1/Time_period
print("The total period (",Time_period,"s)The frequency (",frequency,"Hz)the amplitude (x",amplitude,"m")
plt.grid(?)
plt.xlim(-1,1)
plt.ylim(-1,1)
plt.xticks(
plt.yticks(
plt.xlabel("x")
plt.ylabel("y")
plt.title("Simple Harmonic Motion")

The total period (0.5 s
The frequency (2.0 Hz
The amplitude (0.18 m
```

Out[9]: Text(0.0, 1.0, 'Simple Harmonic Motion')

Question 09 (Damped Oscillation)

For the damped oscillator system, with m = 250 g, k = 85 N/m, and b = 70 g/s, b=0.34s what is the ratio of the oscillation amplitude at the end of 20 cycles to the initial oscillation amplitude?

In [10]:
```
import math
import numpy as np
import numpy
import sympy
import sympy
import symp
```

```python
import matplotlib.pyplot as plt
import numpy as n
P=100
I=3
R=np.divide(P,I**2)
print("The resistance of the system is",R,"Ohms")
```

```
The resistance of the system is 11.11111111111111 Ohms
```

In [ ]:

In [ ]:

In [ ]: