In [23]:
```
print('Jaeheon Kim, Nico Bui,Vishwa Kumaravel, Alex Dao ')
```

```
Jaeheon Kim, Nico Bui,Vishwa Kumaravel, Alex Dao
```

In [24]:
```
f = 4*(log(1.29)+ln(11.1))/(2027-12**3)
print('1(a)',f)
```

```
1(a) 0.0356065194206270
```

In [25]:
```
from sympy import *
from math import degrees
```

In [26]:
```
print('1(b) Exact value:')
b = sin(11*pi/12)*cos(75*pi/180)+cos(165*pi/180)*sin(5*pi/12)
b
```

```
1(b) Exact value:
```

Out[26]:
$$\left(\frac{\sqrt{2}}{4}+\frac{\sqrt{6}}{4}\right)\left(-\frac{\sqrt{6}}{4}-\frac{\sqrt{2}}{4}\right)+\left(-\frac{\sqrt{2}}{4}+\frac{\sqrt{6}}{4}\right)^2$$

In [27]:
```
print(f'1(b) approximate value:{float(b)}')
```

```
1(b) approximate value:-0.8660254037844386
```

In [28]:
```
print('Prove: (sinx)**2+0.5*cos(2x)-0.5')
```

```
Prove: (sinx)**2+0.5*cos(2x)-0.5
```

In [29]:
```
x = symbols('x')
f = (sin(x))**2+0.5*cos(2*x)-0.5
```

In [30]:
```
print('2(a)')
f.subs(x,pi/3)
```

```
2(a)
```

Out[30]:
$$0$$

In [31]:
```
print('2(b)')
f.subs(x,2.13)
```

```
2(b)
```

Out[31]:
$$5.55111512312578 \cdot 10^{-17}$$

In [32]:
```
print('3(a)')
a = Array([2,3])
b = Array([-1,5])
print(f'a+b={a+b}')
print(f'a-b={a-b}')
print(f'a-b={3*a-5*b}')
```

```
3(a)
a+b=[1, 8]
a-b=[3, -2]
a-b=[11, -16]
```

In [33]:
```
print('3(b)')
angle  = atan(3/2)
print(f'Angle a is {angle}')
```

```
3(b)
Angle a is 0.982793723247329
```

In [34]:
```
print('3(c)')
a = 11/sqrt(11**2+(-16)**2)
b = -16/(sqrt(11**2+(-16)**2))
print(f'Unit vector in the direction of 3a-5b is')
print('<',a,',',b,'>')
```

```
3(c)
Unit vector in the direction of 3a-5b is
< 11*sqrt(377)/377 , -16*sqrt(377)/377 >
```

In [35]:
```
force = sqrt(5**2+9**2)
f = Matrix([5,9])
A = Matrix([3,4])
B = Matrix([5,10])
disp = B-A
disp.mag = sqrt(2**2+6**2)
print(f'4(a) The magnitude of the force vector is:')
force
```

```
4(a) The magnitude of the force vector is:
```

Out[35]: $\sqrt{106}$

In [36]:
```
print(f'4(b)The displacement vector is: {disp}')
```

```
4(b)The displacement vector is: Matrix([[2], [6]])
```

In [37]:
```
print(f'4(c) Magnitude of the displacement vector is:')
disp.mag
```

```
4(c) Magnitude of the displacement vector is:
```

Out[37]: $2\sqrt{10}$

In [38]:
```
print('4(d)The work done is:')
wd = disp.dot(f)
wd
```

```
4(d)The work done is:
```

Out[38]: 64

In [39]:
```
print('4(e)The cosine of the angle between <5,9> and <2,6> is :')
cosangle = wd/(force*disp.mag)
cosangle
```

```
4(e)The cosine of the angle between <5,9> and <2,6> is :
```

Out[39]: $\frac{16\sqrt{265}}{265}$

In [40]:
```
print('4(f)The angle between <5,9> and <2,6> is:')
angle = float(degrees(acos(cosangle)))
print(f'{angle:.3f} degrees')
```

```
4(f)The angle between <5,9> and <2,6> is:
10.620 degrees
```

In [ ]: