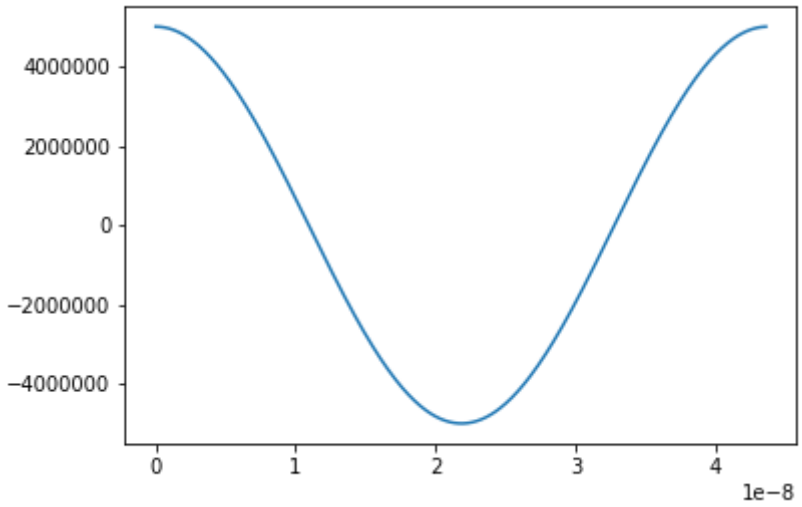
In [22]:
```
import numpy as np
import math
import matplotlib.pyplot as plt
```

In [23]:
```
speed_of_light = 3E8
B_field = [0.0, 0.0, -1.5]
bmag = np.linalg.norm(B_field)
```

In [24]:
```
class Particle:
        def __init__(self, position, velocity, mass, charge):
                self.position = position
                self.velocity = velocity
                self.mass = mass
                self.charge = charge

        def period(self):
                field = np.linalg.norm(B_field)
                period = 2.0 * math.pi * self.mass /( field * self.charg
e )
                return period
```

In [29]:
```
# choose a proton as the particle, describe in 3 Dimension
proton = Particle([0.00, 0.0, 0.0], [0.05*speed_of_light, 0.0, 0.0], 1.6
7E-27, +1.60E-19)


n = 400
t = np.zeros([n])
h = proton.period() / n
for i in range(1, n):                #run this code for every value of i,
 where i = [1,2,3,...,n-1]
    t[i] = t[i-1] + h                 #t_(n+1) = t_n + h

q = +1.60E-19
V_0 = 3.125e+25
V = V_0 * np.cos(ang_frequency * t)


E = V * q
#particle period
Period = proton.period()
# angular frequency
ang_frequency = (2.0 * math.pi)/Period

plt.plot(t,E)
plt.show()

print('Electric Field at half period is',q*V_0 * np.cos(ang_frequency *
Period/2))
print('Electric Field at one period is',q*V_0 * np.cos(ang_frequency * P
eriod))
```




```
Electric Field at half period is -5000000.0
Electric Field at one period is 5000000.0
```