Flight path of ball

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The programme plots a graph of the height of the ball as a function of time. The graph will be used to find an approximate time for the ball to hit the ground. The formula for the flight path is:

$$x_t = x_0 + v_0 * t + \frac{1}{2} * a * t^2$$

Steps:

- Assign the given values for v_0, x_0, t and a
- Use the above formula to get a function of height with respect to time
- Plot a graph of x_t against time
- Use this graph to find the approximate time for the ball to hit the ground

In [7]:

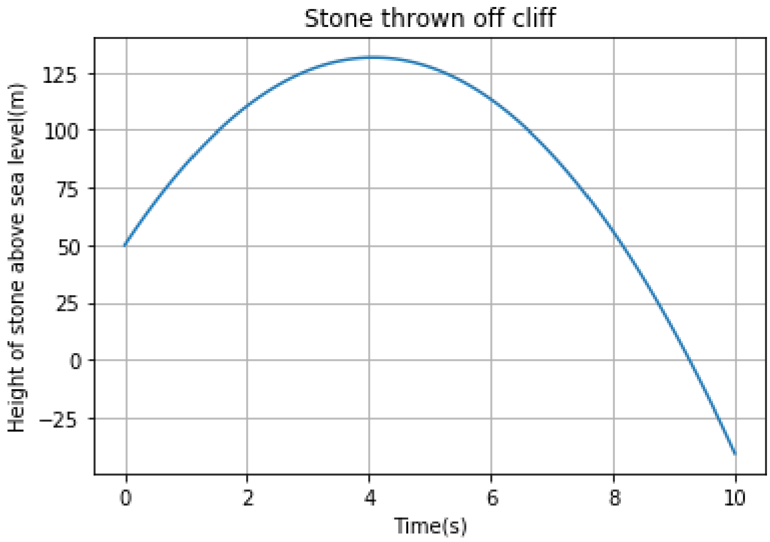
```
import numpy as np
import matplotlib.pyplot as plt

#Define an array of time values
t = np.linspace(0, 10, 100)

#Set specific values of x_i and a
u = 40    #ms^-1
x_i = 50  #m
a = -9.81 #ms^-2

#Define function of x_t
x_t = x_i + u*t + (0.5)*a*(t**2)

#Plot x_t as a function of time
plt.plot(t, x_t)
plt.title("Stone thrown off cliff")
plt.xlabel("Time(s)")
plt.ylabel("Height of stone above sea level(m)")
plt.grid()
plt.show()
```

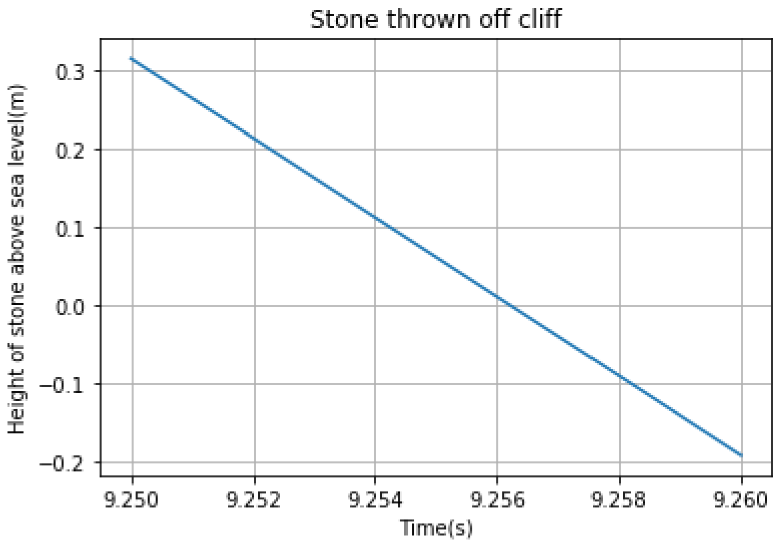


The following code will zoom into the region where the stone hits the sea level to get a more accurate result for the time taken.

In [17]:

```
#New array for zoomed in graph
t = np.linspace(9.25, 9.26, 100)
x_t = x_i + u*t + (0.5)*a*(t**2)

#Plot x_t as a function of time over area  of interest
plt.plot(t, x_t)
plt.title("Stone thrown off cliff")
plt.xlabel("Time(s)")
plt.ylabel("Height of stone above sea level(m)")
plt.grid()
plt.show()
```



It takes the rock about 9.256 seconds to hit sea level.