Assignment 5

Problem 3

Part a

Make a plot of the function $y(t) = v_0 t - \frac{1}{2}gt^2$ for $v_0 = 10, g = 9.81$, and $t \in [0, 2v_0/g]$. Set the axes labels as time (s) and height (m).

Solution

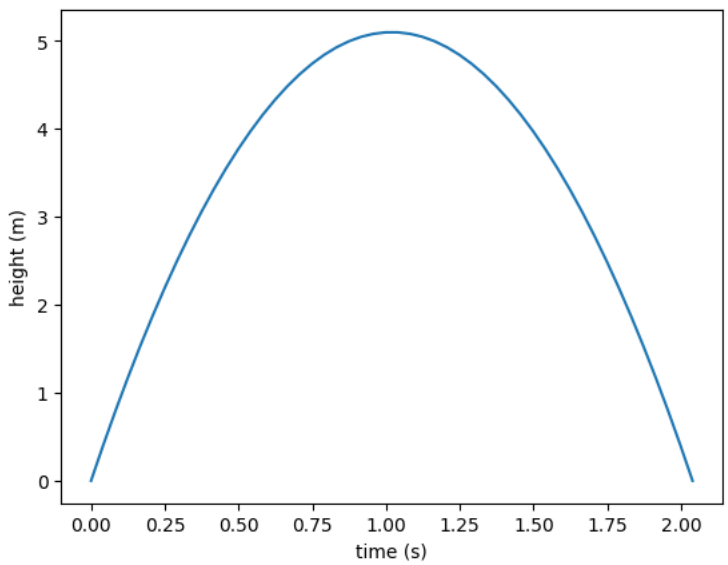
```
import numpy as np
import matplotlib.pyplot as plt

def graph(formula, x_range):
    x = np.array(x_range)
    y = formula(x)
    plt.xlabel("time (s)")
    plt.ylabel("height (m)")
    plt.plot(x, y)
    plt.savefig("parta.pdf")
    plt.savefig("parta.png")
    plt.show()

v0 = 10
g = 9.81

formula = lambda t: v0*t - (1/2)*g*(t**2)

n = 50
graph(formula, np.linspace(0, 2*v0/g, n))
```



Part b

Plot two curves of the function $y(t) = v_0 t - \frac{1}{2}gt^2$ for two different initial velocities in one figure, by taking $v_0 = 10$ and $v_0 = 8$. For each curve, you need to define a different vector/array of t in the range $t \in [0, 2v_0/g]$. Set $g = 9.81$.

Use different colors and markers to distinguish two curves, and define a legend appropriately. Set the axes labels as time (s) and height (m).

```
def graph(formula1, x_range1, formula2, x_range2):
    x1 = np.array(x_range1)
    x2 = np.array(x_range2)
```

```
    y1 = formula1(x1)
    y2 = formula2(x2)
    plt.xlabel("time (s)")
    plt.ylabel("height (m)")
    plt.plot(x1, y1, 'r', x2, y2, 'b')
    plt.legend(['v0 = 10', 'v0 = 8'])
    plt.savefig("partb.pdf")
    plt.savefig("partb.png")
    plt.show()

g = 9.81
n = 50

v0 = 10
x1 = np.linspace(0, 2*v0/g, n)
formula1 = lambda t: 10*t - (1/2)*g*(t**2)

v0 = 8
x2 = np.linspace(0, 2*v0/g, n)
formula2 = lambda t: 8*t - (1/2)*g*(t**2)

graph(formula1, x1, formula2, x2)
```