phi-6

October 16, 2024

1 Homework #6: Energy and Forces

```
[1]: import numpy as np
     import matplotlib.pyplot as plt
     from scipy.integrate import odeint

     eta = 1e-3
     R = 1.5
     v0 = 4 * 1000 / 3600
     mass_submarine = 1024 * (4/3) * np.pi * R**3

     def velocity(v, t):
         return -6 * np.pi * eta * R * v / mass_submarine

     t = np.linspace(0, 200, 1000)

     v_initial = v0

     v_t = odeint(velocity, v_initial, t)

     x_t = np.cumsum(v_t) * (t[1] - t[0])

     plt.figure(figsize=(10, 5))

     plt.subplot(1, 2, 1)
     plt.plot(t, v_t)
     plt.title("Velocity vs Time")
     plt.xlabel("Time (s)")
     plt.ylabel("Velocity (m/s)")

     plt.subplot(1, 2, 2)
     plt.plot(t, x_t)
     plt.title("Position vs Time")
     plt.xlabel("Time (s)")
     plt.ylabel("Position (m)")

     plt.tight_layout()
```
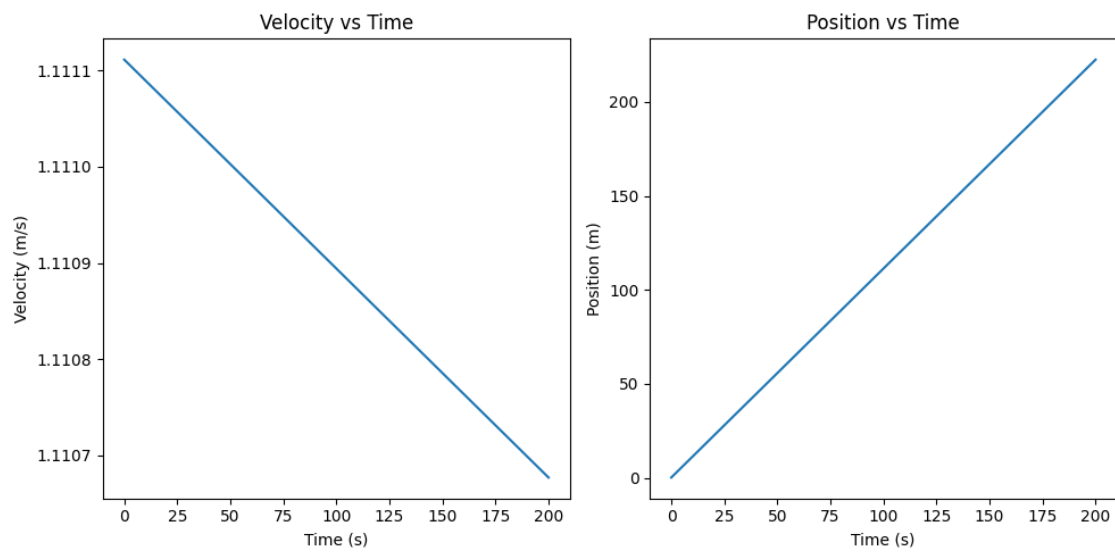
```
plt.show()

x_t[-1]
```

Velocity vs Time

Position vs Time

[1]: 222.40122632444857