Part D

We try to find k_1 and k_2 in the following equation:

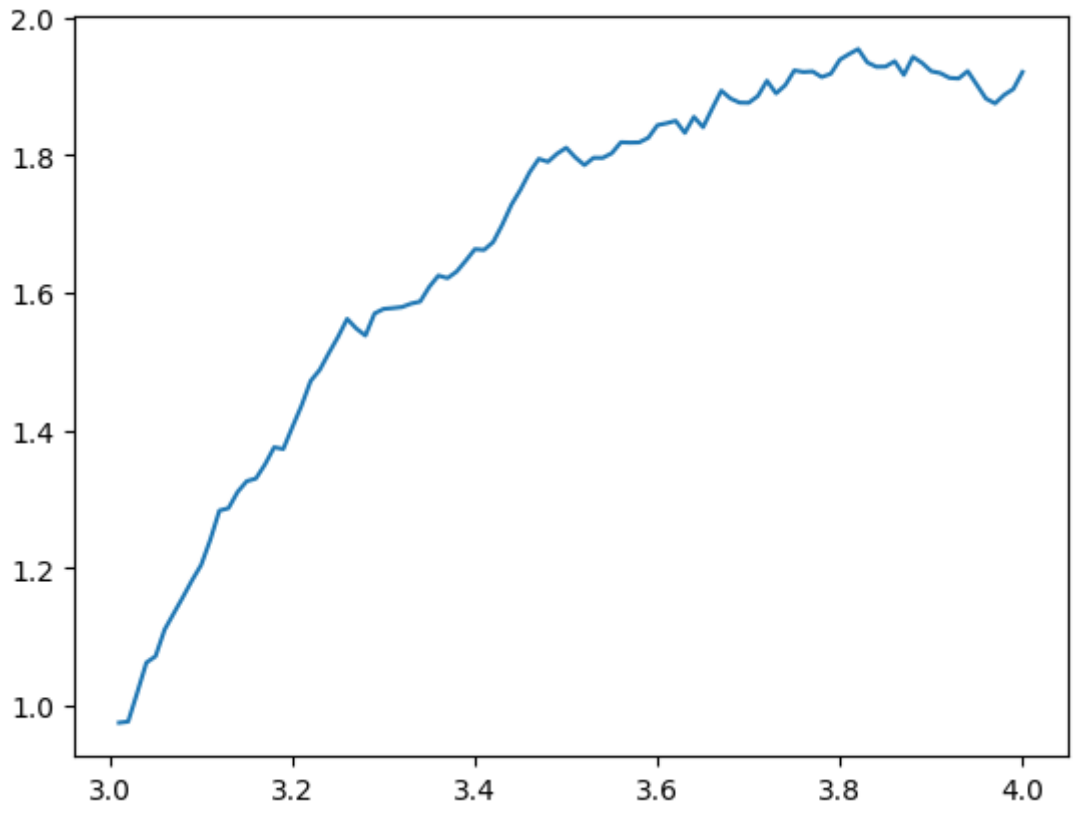
$$\frac{dv}{dt} = k_1 \cdot \text{throttle} - k_2 \cdot v + \text{noise}$$

We find this by trying to fit an equation to the given dataset

In [ ]:
```
#processing the data
datafile = open("dataset_bolt_model.txt", 'r')
data = datafile.readlines()[1:]
processed_data = [list(map(float, line.split())) for line in data]
t_values = [i[0] for i in processed_data] #x-axis
v_values = [i[1] for i in processed_data] #y-axis
#print(x_values, '\n', y_values)
```

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

In [ ]:
```
plt.plot(t_values, v_values);
```



In [ ]:
```
def fitfunc(t, k1, k2):
    throttle = 40
    v0 = 1

    def myode(v,t):
        dvdt = k1*throttle - k2*v
        return dvdt
```

```
    v_sol = scipy.integrate.odeint(myode, v0, t)
    return v_sol[:,0]

k_fit, kcov = scipy.optimize.curve_fit(fitfunc, t_values, v_values, p0 =

print(k_fit)
```

```
[0.1455843  2.89762074]
```

We now check if the k values given by the code looks okay. (Sanity check)

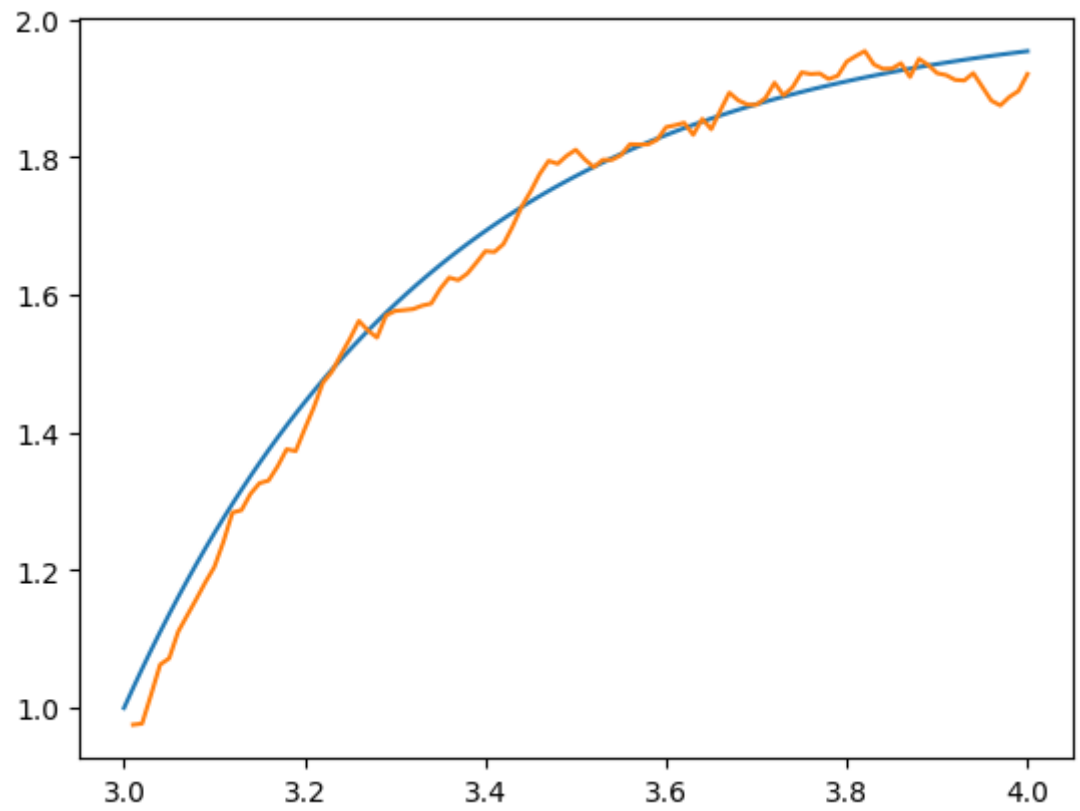
In [ ]:
```
def myode(v,t):
    dvdt = k1*throttle - k2*v
    return dvdt

k1, k2 = k_fit
throttle = 40
v0 =1

x_vals = np.linspace(3, 4, 100)
y_vals = scipy.integrate.odeint(myode, v0, x_vals)

plt.plot(x_vals, y_vals);
plt.plot(t_values, v_values);
print(k1, k2)
```

```
0.145584295473428 2.8976207362313526
```



We have achieved what we wanted to do, i.e found out the values of k1 and k2.

k1 = 0.145584295473428

k2 = 2.8976207362313526