Finding Parameters

Finding Natural Frequency

```
% angles taken from the serial moniter when Rocky was swung back and forth
angles = [1.65
1.64
1.63
1.62
1.61
1.66
1.66
1.68
1.71
1.75
1.81
1.86
1.93
2.02
2.11
2.22
2.32
2.44
2.56
2.65
2.74
2.82
2.87
2.90
-1.66
-1.66
-1.69
-1.73
-1.79
-1.86
-1.93
-2.02
-2.10
-2.16
-2.24
-2.31
-2.35
-2.39
1.66
1.66
1.69
1.72
1.78
1.85
1.92
2.00
2.08
2.14
```

```
2.21
2.26
2.28
2.29
-1.66
-1.68
-1.71
-1.76
-1.82
-1.90
-1.95
-2.03
-2.10
-2.15
-2.21
-2.24
-2.26
1.66
1.67
1.70
1.75
1.81
1.88
1.95
2.01
2.09
2.15
2.19
2.23
-1.66
-1.66
-1.67
-1.70
-1.74
-1.80
-1.85
-1.92
-1.99
-2.04
-2.11
-2.16
-2.19
-2.21
1.66
1.66
1.69
1.72
1.78
1.84
1.90
1.97
2.04
2.09
2.15
```

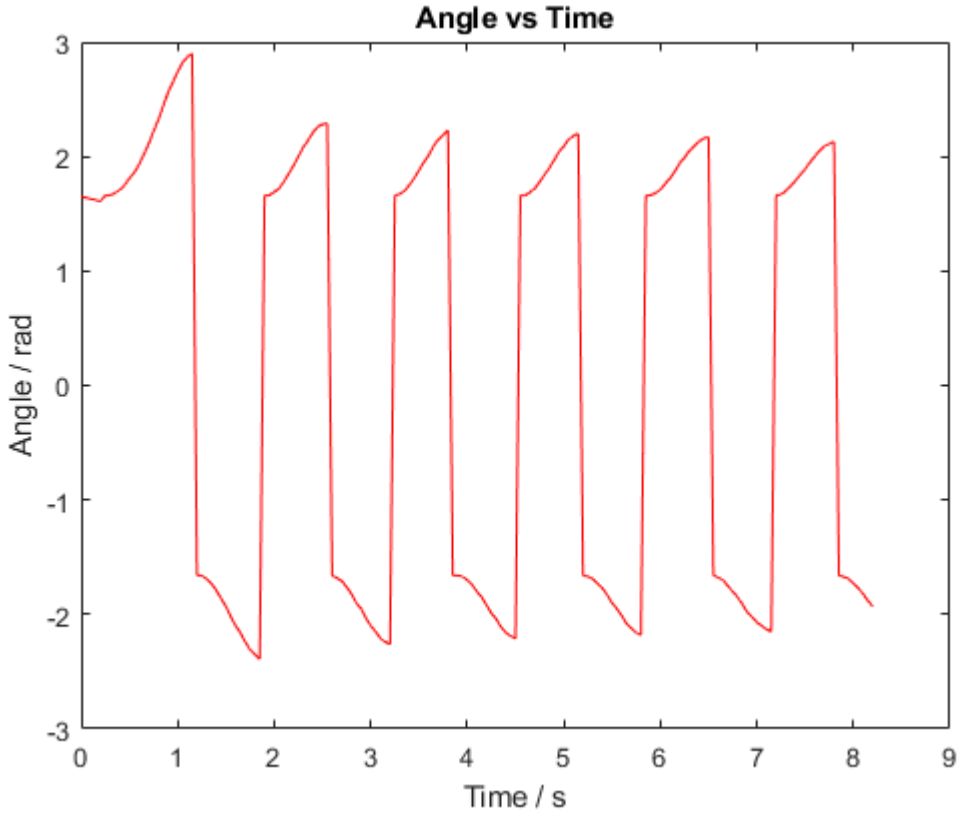
```
2.18
2.20
-1.66
-1.67
-1.69
-1.73
-1.77
-1.83
-1.90
-1.95
-2.01
-2.08
-2.12
-2.16
-2.18
1.66
1.66
1.68
1.71
1.76
1.81
1.87
1.94
1.99
2.05
2.09
2.13
2.16
2.17
-1.66
-1.68
-1.70
-1.75
-1.80
-1.85
-1.91
-1.98
-2.02
-2.07
-2.10
-2.13
-2.15
1.66
1.67
1.70
1.74
1.79
1.84
1.89
1.95
2.00
2.05
2.09
2.11
```

```
2.13
-1.66
-1.67
-1.69
-1.73
-1.77
-1.82
-1.88
-1.93
];
```

```
% making it so the spacing between points is 1/20th of the second
total = 165;
t = linspace(0,0.05*(total - 1),total);
```

```
t = 1×165
         0    0.0500    0.1000    0.1500    0.2000    0.2500    0.3000    0.3500 ···
```

```
% plotting time vs angle
plot(t,angles,'r')
xlabel('Time / s')
ylabel('Angle / rad')
title('Angle vs Time')
```




```
% period is about 1, nf is 2pi/period
period = 3.8 -2.55;
```

```
%finding natural frequency
natural_freq = 2*pi/(period)
```

```
natural_freq = 5.0265
```

```
g = 9.8;
l = g/(natural_freq^2)
```

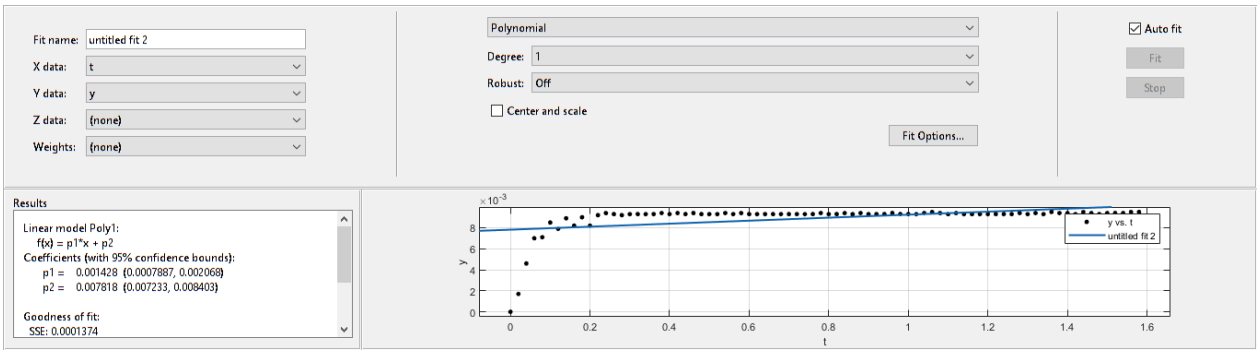
```
l = 0.3879
```

```
%converting l in meters to inches: 0.3879 m = 15.27 inches
```

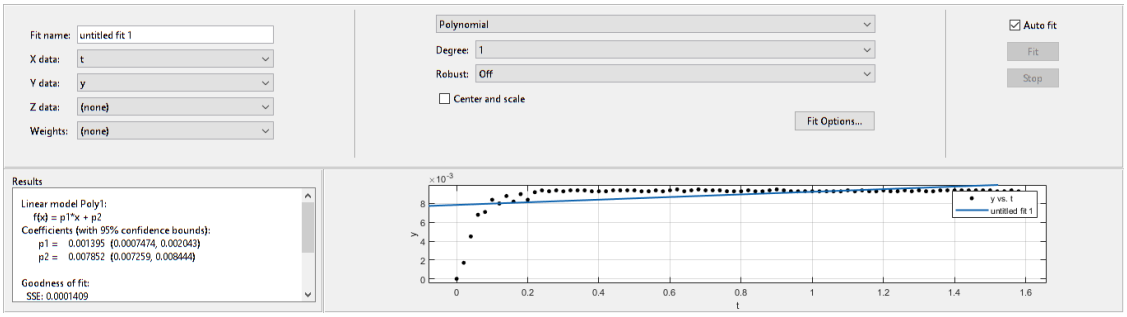
Finding Motor Parameters

```
% data for the left and right wheel speeds taken from the serial moniter of
% the arduino
left_R =[0.00,0.00;
0.17,0.15;
0.45,0.45;
0.68,0.68;
0.71,0.71;
0.84,0.84;
0.80,0.79;
0.88,0.89;
0.82,0.82;
0.90,0.92;
0.84,0.85;
0.92,0.92;
0.94,0.92;
0.93,0.93;
0.94,0.93;
0.93,0.94;
0.94,0.93;
0.94,0.93;
0.94,0.93;
0.93,0.92;
0.93,0.93;
0.93,0.93;
0.94,0.94;
0.94,0.94;
0.94,0.94;
0.94,0.94;
0.93,0.93;
0.93,0.94;
0.94,0.94;
0.93,0.94;
0.94,0.94;
0.95,0.93;
0.93,0.93;
0.94,0.93;
0.95,0.93;
0.94,0.93;
0.94,0.94;
0.94,0.94;
```

```
0.93,0.92;
0.93,0.93;
0.93,0.94;
0.94,0.94;
0.93,0.94;
0.93,0.93;
0.94,0.94;
0.95,0.93;
0.94,0.93;
0.93,0.92;
0.93,0.93;
0.93,0.93;
0.93,0.93;
0.93,0.93;
0.93,0.93;
0.93,0.93;
0.93,0.93;
0.93,0.93;
0.94,0.93;
0.93,0.93;
0.94,0.94;
0.93,0.93;
0.93,0.92;
0.94,0.92;
0.93,0.92;
0.93,0.93;
0.94,0.94;
0.93,0.94;
0.94,0.93;
0.93,0.94;
0.93,0.94;
0.94,0.94;
0.94,0.93;
0.94,0.94;
0.94,0.94;
0.94,0.93;
0.94,0.93;
0.94,0.92;
0.94,0.93;
0.93,0.92;
0.93,0.93;
0.94,0.93;
0.93,0.93];
```



```
total = 80;
% divide by 100 to make speed in m/s
wheel_speeds = left_R./100;
% create a time variable in seconds
t = linspace(0,0.02*(total - 1),total);
% curve fitting
cftool(t,wheel_speeds(:,1))
```



The values from the cftool that we got for a and b are 17.84 and 0.009341.