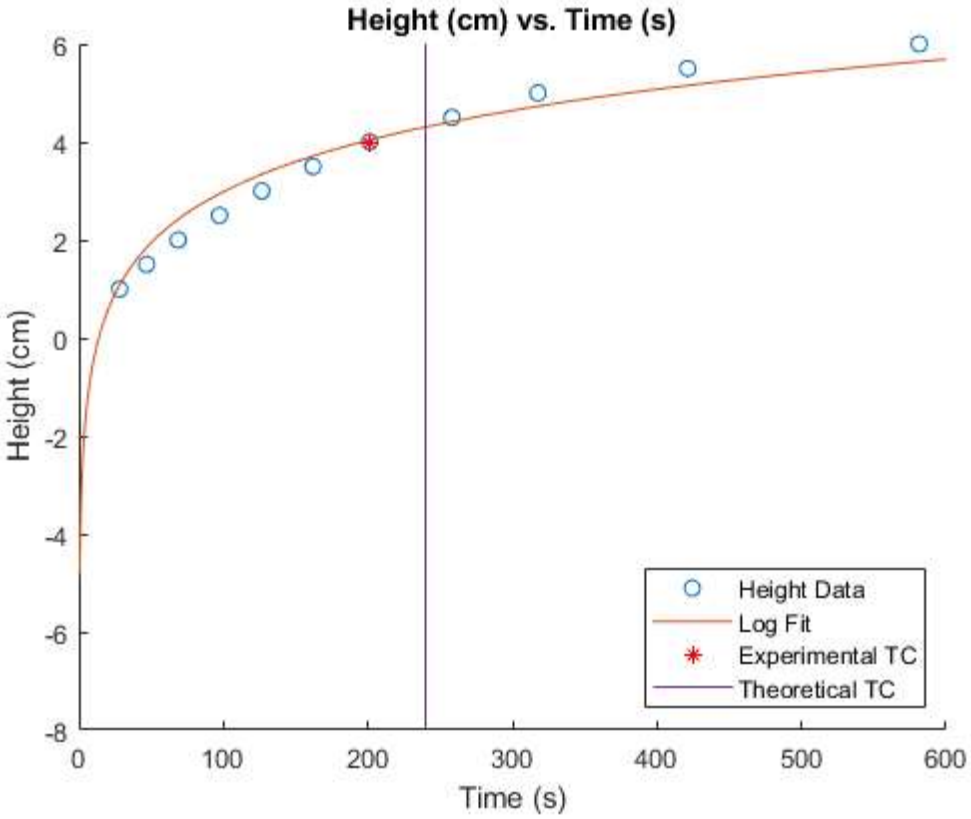
Lab 3 - Water System

3/25/21 Michael White Section 3 / Online

```
close all;
clear all;
clc;

% Import data table for voltage
wData = readtable('waterData.xlsx');

% Input/calculate parameters related to time constant value
g = 9.81; %m/s^2
diameter = 0.0635; %m
A = pi/4*diameter^2; %m^2
R = 743000; %1/ms
TheoTau = A*R/g;

% Pull logarithmic fit function from excel
syms logFit(x);
logFit(x) = 1.5067*log(x)-3.9509;
ExpTau(2) = 0.632*6.4; %Found this to be roughly the max height experimentally

% Find the closest point to the calculated time constant value
absDiffList = abs(wData.Height-ExpTau(2));
ExpTau = ...
    [wData.TimeElapsed(absDiffList == min(absDiffList)),...
     wData.Height(absDiffList == min(absDiffList))];

% Plot figure of data with fit line and time constant point.
figure;
hold on;
scatter(wData.TimeElapsed,wData.Height);
fplot(logFit(x));
scatter(ExpTau(1),ExpTau(2),'*r');
plot([TheoTau,TheoTau],[-8,6]);

% Cleanup graph and add legend, title, and labels
title('Height (cm) vs. Time (s)');
legend({'Height Data','Log Fit','Experimental TC','Theoretical TC'},'Location','southeast');
xlabel('Time (s)');
ylabel('Height (cm)');

% Display results to command window
disp('Theoretical TC =');disp(TheoTau);
disp('Experimental TC =');disp(ExpTau(1));
```

```
Theoretical TC =
  239.8596

Experimental TC =
  201.2200
```



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