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| FACULTY OF ENGINEERING |  | CAIRO UNIVERSITY | Application  Description automatically generated with medium confidence |
| 4th Year | | | |
| Course: Electrical Power Systems (3)  (EPE4010) | | | |

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Assignement no.: HW1 - HW2

Instructor: Dr. Mohamed Rabah

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HW2

# Basic EV model development to validate acceleration specification

# Validation of acceleration specification using a basic EV simulation model

## INITIAL CONDITIONS

A close-up of a computer code

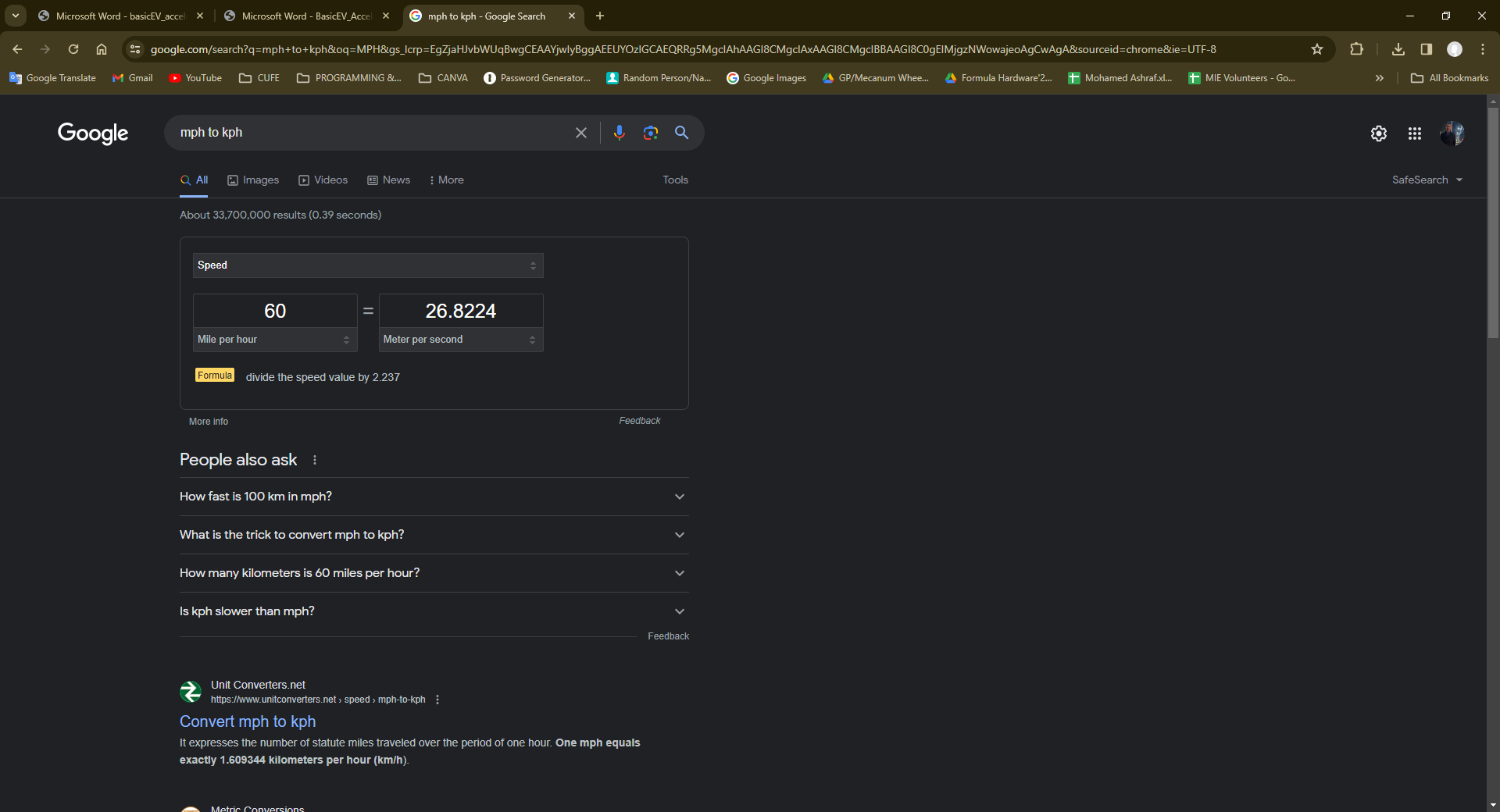
Description automatically generated



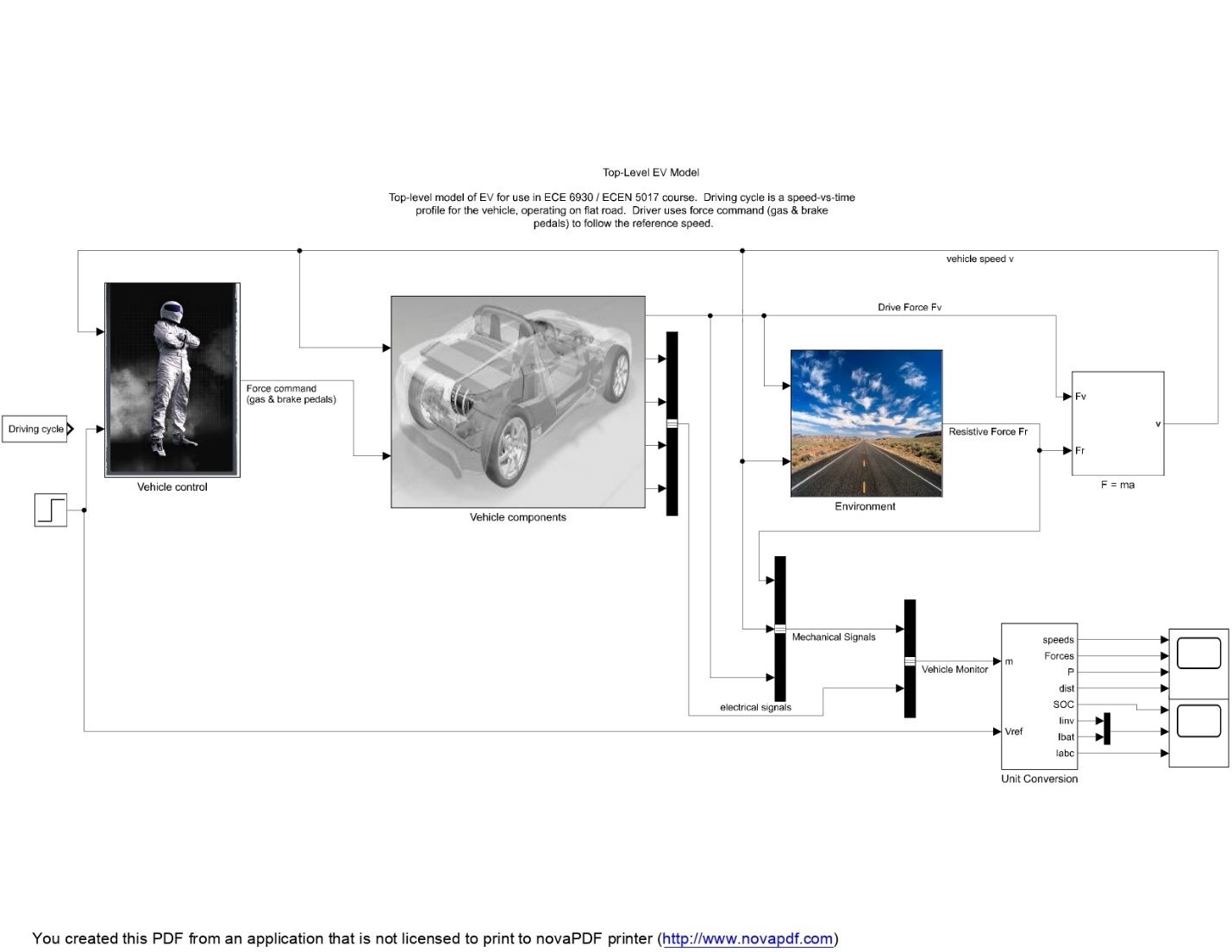
## Verify the analytical results of (a) via simulation using the following steps:

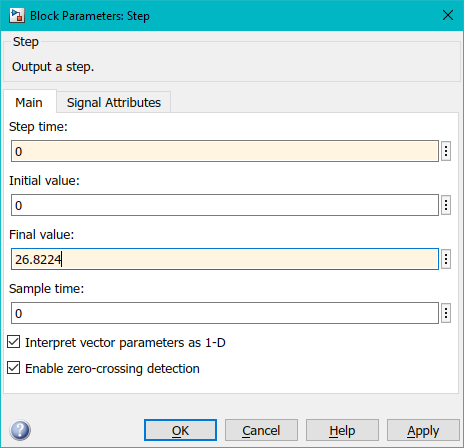
*N.B. 1: a) Solve the approximate accelerate time ta from 0 to 60 MPH.*

*N.B. 2: 60MPH = 26.8224 M/S.*



## Build the basic EV Simulink simulation model described in the “Intro to MATLAB/Simulink” supplementary lecture (posted online with the course lectures)





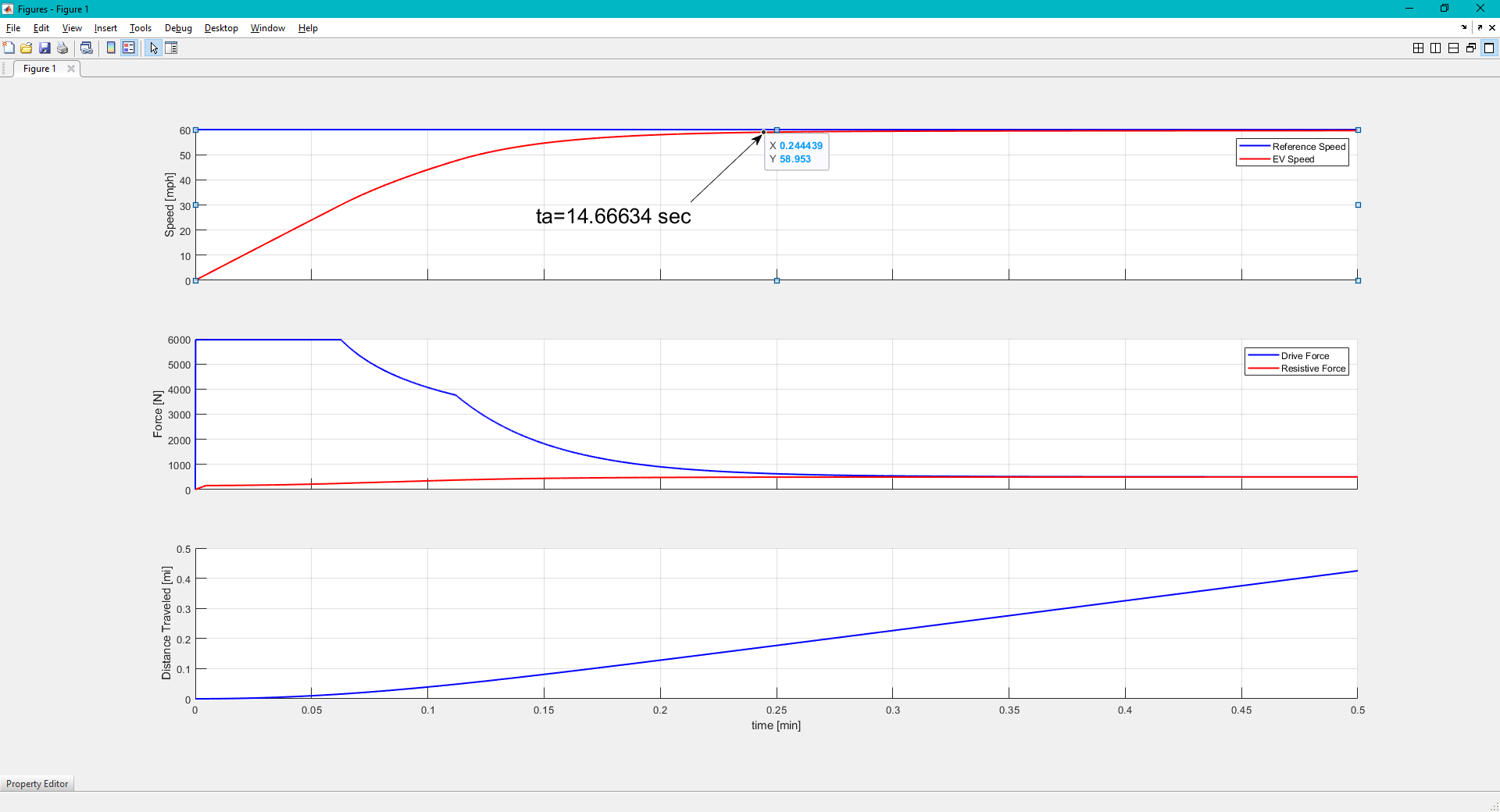
## Simulate the model with the parameters above and show the resulting plot with speed v [mph] and tractive propulsion force Fv [N] and the solved acceleration time ta.

OUTPUTS OF THE SIMULATION (v, Fv, DISTANCE)

A screen shot of a graph

Description automatically generated

CLOSE VIEW OF THE OUTPUTS (t=0-0.5 min)



## Verify the analytical results of (b) via simulation using the following steps

• Modify the basic EV model to include the following signals

A close-up of a car

Description automatically generated

A diagram of a computer program

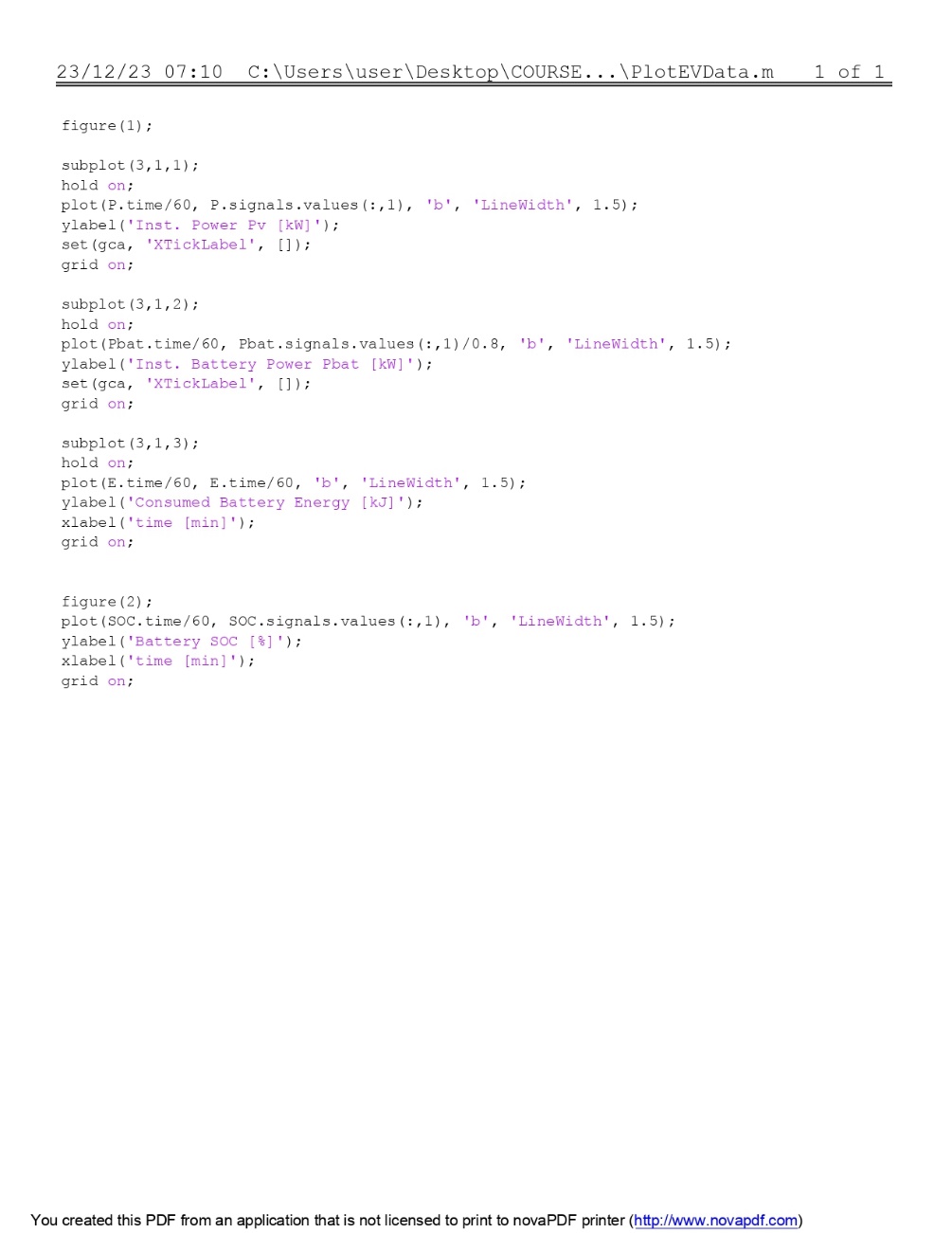
Description automatically generated

* Vehicle tractive power Pv
* Battery power, Pbatt = Pv / ηtw
* Total battery energy used, Ebatt (integral of battery power)

A screenshot of a computer

Description automatically generated

• Modify the PlotEVData.m file to add two additional subplots with the signals



* Pv and Pbatt
* Ebatt

GRAPH 1: Pv GRAPH 2: Pbat GRAPH 3: Ebat

A screenshot of a computer

Description automatically generated

BATTERY SOC

A graph showing a line

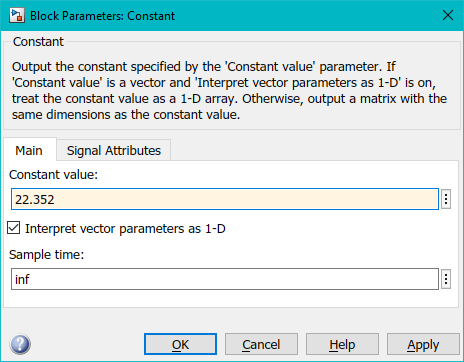
Description automatically generated with medium confidence

# System Simulation of Leaf-Sized Electric Vehicle

For the vehicle cruising in steady-state with velocity Vcruise = 50 mph on a flat road,

A screenshot of a computer

Description automatically generated



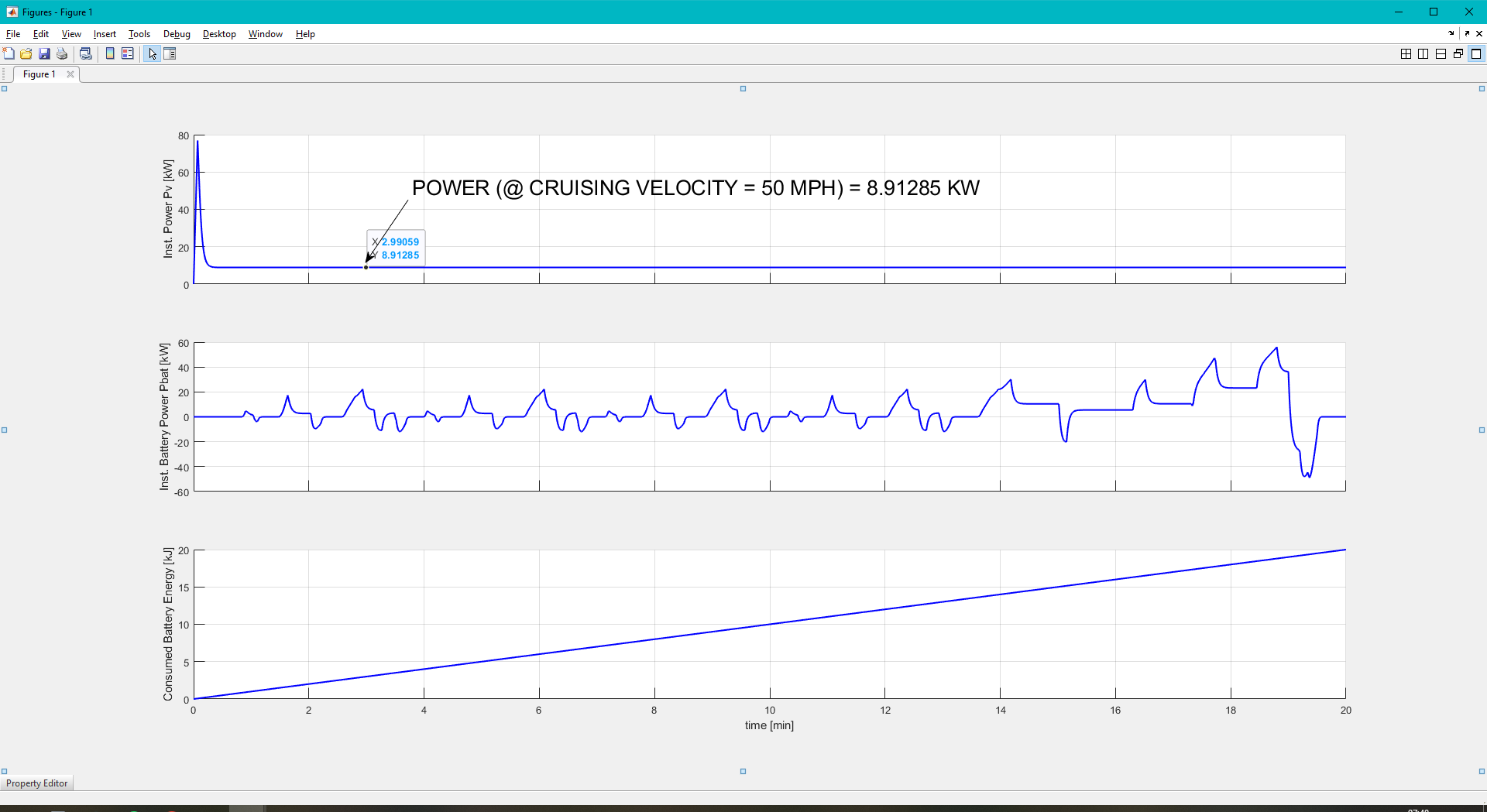
A close-up of a car

Description automatically generated

A diagram of a computer program

Description automatically generated

* Calculate the vehicle power Pv required to maintain cruise velocity



## Run the driving cycle eudc with tstop=1200 at two gear ratios, gratio = 7.94 and version from (a).

A screenshot of a computer

Description automatically generated

* Measure and report the total energy taken from the battery over the course of the entire driving cycle with your optimal gratio
* Compare the two gear ratios in terms of ending SOC and MPGe

A screenshot of a computer

Description automatically generated

GEAR RATIO=7.94

Ebatt SOC MPGe

A screenshot of a computer

Description automatically generated

* Turn in the plots of the motor torque Tm vs angular speed ωm path of the vehicle over the drive cycle overlaid on the motor efficiency contours

GEAR RATIO = 7.94

