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```
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% ENGR 132
% Program Description
%You are an engineer who is tasked with analysing ignition delay data
%with
%two different fuel types. You are tasked with analysing this data to
%determine the relationship between measured temperature and ignition
%delay.
%
% Assignment Information
%   Assignment:      PS 05, Problem 2
%   Author:          Ethan Hotson, ehotson@purdue.edu
%   Team ID:         009-01
%   Contributor:     N/A
%   My contributor(s) helped me:
%       [ ] understand the assignment expectations without
%           telling me how they will approach it.
%       [ ] understand different ways to think about a solution
%           without helping me plan my solution.
%       [ ] think through the meaning of a specific error or
%           bug present in my code without looking at my code.
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
```

INITIALIZATION

```
jetData = csvread('Data_jetA_ignition_delay.csv',1,0);
jetX = jetData(:,1);
jetY = jetData(:,2);
dieselData = csvread('Data_diesel_ignition_delay.csv',1,0);
```

```
dieselX = dieselData(:,1);  
dieselY = dieselData(:,2);
```

SUBPLOT FIGURE(S)

```
%linear subplot  
figure(1)  
subplot(2,2,1)  
plot(jetX,jetY,'.b')  
grid on  
title('Linear Comparison of Temperature to Ignition Delay, Jet Fuel')  
xlabel('1000/Temperature(K), linear scale')  
ylabel('Ignition Delay (ms), linear scale')  
%semilogx subplot  
subplot(2,2,2)  
semilogx(jetX,jetY,'.g')  
grid on  
title('Logarithmic X Comparison of Temperature to Ignition Delay, Jet Fuel')  
xlabel('1000/Temperature(K), log scale')  
ylabel('Ignition Delay (ms), linear scale')  
%semilogy subplot  
subplot(2,2,3)  
semilogy(jetX,jetY,'.r')  
grid on  
title('Logarithmic Y Comparison of Temperature to Ignition Delay, Jet Fuel')  
xlabel('1000/Temperature(K), linear scale')  
ylabel('Ignition Delay (ms), log scale')  
%loglog subplot  
subplot(2,2,4)  
loglog(jetX,jetY,'.k')  
grid on  
title('Logarithmic Axes Comparison of Temperature to Ignition Delay, Jet Fuel')  
xlabel('1000/Temperature(K), log scale')  
ylabel('Ignition Delay (ms), log scale')  
%Diesel figure with subplots  
figure(2)  
subplot(2,2,1)  
plot(dieselX,dieselY,'.b')  
grid on  
title('Linear Comparison of Temperature to Ignition Delay, Diesel Fuel')  
xlabel('1000/Temperature(K), linear scale')  
ylabel('Ignition Delay (ms), linear scale')  
%semilogx subplot  
subplot(2,2,2)  
semilogx(dieselX,dieselY,'.g')  
grid on
```

```

title('Logarithmic X Comparison of Temperature to Ignition Delay,
      Diesel Fuel')
xlabel('1000/Temperature(K), log scale')
ylabel('Ignition Delay (ms), linear scale')
%semilogy subplot
subplot(2,2,3)
semilogy(dieselX,dieselY,'.r')
grid on
title('Logarithmic Y Comparison of Temperature to Ignition Delay,
      Diesel Fuel')
xlabel('1000/Temperature(K), linear scale')
ylabel('Ignition Delay (ms), log scale')
%loglog subplot
subplot(2,2,4)
loglog(dieselX,dieselY,'.k')
grid on
title('Logarithmic Axes Comparison of Temperature to Ignition Delay,
      Diesel Fuel')
xlabel('1000/Temperature(K), log scale')
ylabel('Ignition Delay (ms), log scale')

```

LINEARIZATION

```

%Linearization of the datasets
linear_jet = [log10(jetX),log10(jetY)];
linear_diesel = [log10(dieselX),log10(dieselY)];
%Linear regressions on the datasets
jetReg = polyfit(linear_jet(:,1),linear_jet(:,2),1);
dieselReg = polyfit(linear_diesel(:,1),linear_diesel(:,2),1);

fprintf('The Linear Equation for the Jet Fuel data is:
      Log[Ignition Delay(ms)] = %.4f*Log[1000/Temperature(K)]+%.4f
\n',jetReg(1),jetReg(2));
fprintf('The Linear Equation for the Diesel Fuel data is:
      Log[Ignition Delay(ms)] = %.4f*Log[1000/Temperature(K)]+%.4f
\n',dieselReg(1),dieselReg(2));

%Figure of linearized data and lines of best fit
figure(3)
hold all
plot(linear_jet(:,1),linear_jet(:,2),'.r')
plot(linear_diesel(:,1),linear_diesel(:,2),'.k')
grid on;
title('Linearized Temperature and Ignition Delay of Jet Fuel and
      Diesel');
xlabel('1000/Temperature(k)');
ylabel('Ignition Delay(ms)');

```

```

jetRef = reffline(jetReg(1),jetReg(2));
jetRef.Color = 'r';
dieselRef = reffline(dieselReg(1),dieselReg(2));
dieselRef.Color = 'k';
legend('Jet Fuel','Diesel','Jet Fuel Line','Diesel Line')

The Linear Equation for the Jet Fuel data is: Log[Ignition Delay(ms)]
= 29.0664*Log[1000/Temperature(K)]+-2.6006
The Linear Equation for the Diesel Fuel data is: Log[Ignition
Delay(ms)] = 30.0610*Log[1000/Temperature(K)]+-2.5192

```

MODEL

```

%Prints the Power Equations of the two datasets
fprintf('The Jet Fuel Power Equation is: Ignition Delay (ms) = %.4f *
(Log[1000/Temperature(K)]) ^ (0.4f)\n',jetReg(1),jetReg(2));
fprintf('The Diesel Power Equation is: Ignition Delay (ms) = %.4f *
(Log[1000/Temperature(K)]) ^ (0.4f)\n',dieselReg(1),dieselReg(2));
%Jet Fuel Figure containing normal data and power function
figure(4)
hold all
plot(jetX,jetY,'.g')
jetCurve = 10 ^ (jetReg(2)) * (jetX .^ jetReg(1));
plot(jetX,jetCurve,'-r')
grid on
xlabel('1000/Temperature(K)')
ylabel('Ignition Delay (ms)')
title('Jet Fuel Data with Curve')
%Diesel Figure containing normal data and power function
figure(5)
hold all
plot(dieselX,dieselY, '.b')
dieselCurve = 10 ^ (dieselReg(2)) * (dieselX .^ dieselReg(1));
plot(dieselX,dieselCurve,'-k')
grid on
title('Diesel Data with Curve')
xlabel('1000/Temperature(K)')
ylabel('Ignition Delay (ms)')

The Jet Fuel Power Equation is: Ignition Delay (ms) = 29.0664 *
(Log[1000/Temperature(K)]) ^ (-2.6006)
The Diesel Power Equation is: Ignition Delay (ms) = 30.0610 *
(Log[1000/Temperature(K)]) ^ (-2.5192)

```

ANALYSIS

-- Q1

From the plots of both datasets, it appears that in both cases, a log-log scale for both axes is the best representation of the data because it makes the data appear linear. This is somewhat true for both the semilogx and semilogy plots, but the most apparently good representation is still in the log-log plot. This suggests that the the best function to represent the data would be a power function.

ACADEMIC INTEGRITY STATEMENT

I have not used source code obtained from any other unauthorized source, either modified or unmodified. Neither have I provided access to my code to another. The script I am submitting is my own original work.

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