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## Table of Contents

.....	1
Problem 1 .....	1
Problem 2 .....	3
Problem 3 .....	6

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% ABE 457

% Homework 1

clc;

clear;

## Problem 1

```
fprintf('Problem 1:\n');
data = [0.01, 2.8; 0.02, 3.3; 0.05, 4.46; 0.1, 6.0; 0.2, 8.48; 0.5,
        14.3; 1.0, 22.0];
tau = data(:,2);
gamma = data(:,1);
```

```
figure
plot(gamma,tau);
title('Problem 1: Original Data');
xlabel('gamma (1/s)');
ylabel('tau (Pa)');
xlim([0,1]);
ylim([0,25]);
```

```
tau_0_ketchup = 2.5;
```

```
f = log(data);
x = f(:,1);
y = f(:,2);
p = polyfit(x,y,1);
n_ketchup = p(1,2);
k_ketchup = exp(p(1,2));
line = polyval(p,x);
```

```
figure
scatter(x, y, '.k');
title('Problem 1: Log-Log Plot');
xlabel('ln(gamma)');
ylabel('ln(tau)');
xlim([-5,0]);
ylim([0,4]);
hold on;
```

---

```
plot(x, line, '-');
legend('Data','Linear Regression');
hold off;

fprintf('Model: tau = %f + %f * gamma ^ %f\n', tau_0_ketchup,
    k_ketchup, n_ketchup);
fprintf('tau_not = %f\n',tau_0_ketchup);
fprintf('k = %f\n', k_ketchup);
fprintf('n = %f\n\n', n_ketchup);
```

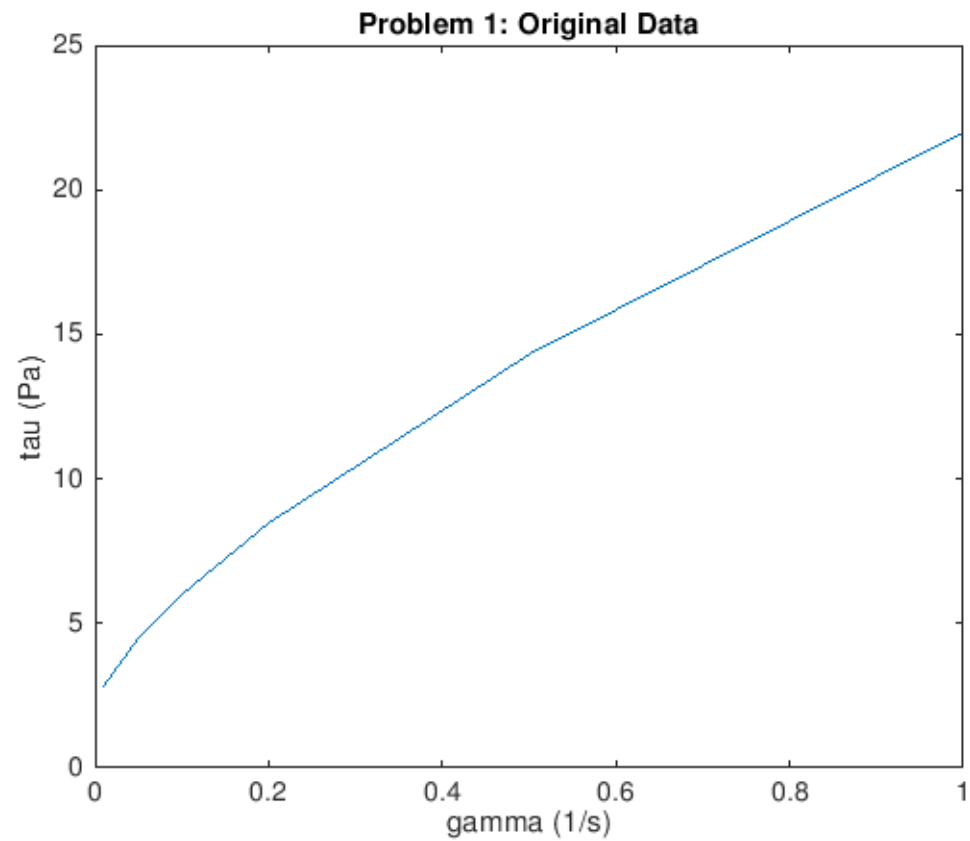
*Problem 1:*

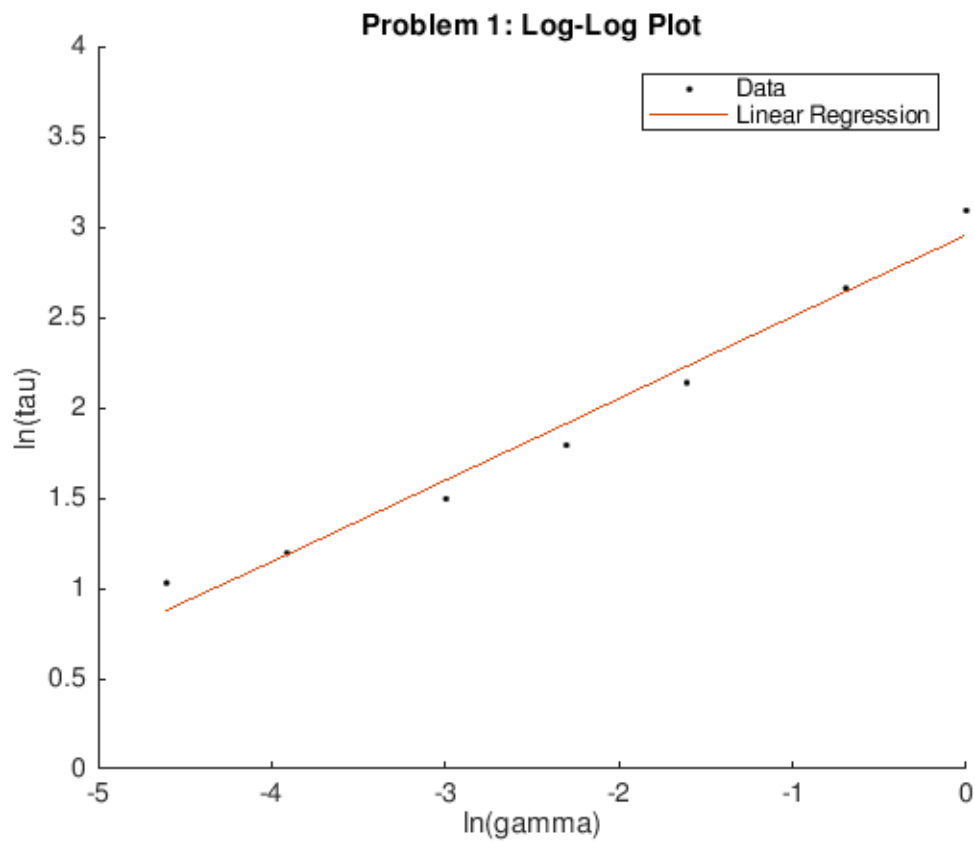
*Model:  $\tau = 2.500000 + 19.156726 * \gamma ^ 2.952654$*

*$\tau_{not} = 2.500000$*

*$k = 19.156726$*

*$n = 2.952654$*





## Problem 2

```
fprintf('Problem 2:\n');

data = [0.1, 14.97; 0.2, 17.33; 0.5, 22.5; 1.0, 29.14; 2.0, 40.0; 5.0,
        66.62; 10.0, 104.72];
tau = data(:,2);
gamma = data(:,1);

figure
plot(gamma,tau);
title('Problem 2: Original Data');
xlabel('gamma (1/s)');
ylabel('tau (Pa)');
xlim([0,10]);
ylim([0,105]);

tau_0_milk = 14;

f = log(data);
x = f(:,1);
y = f(:,2);
p = polyfit(x,y,1);
n_milk = p(1,2);
```

---

```

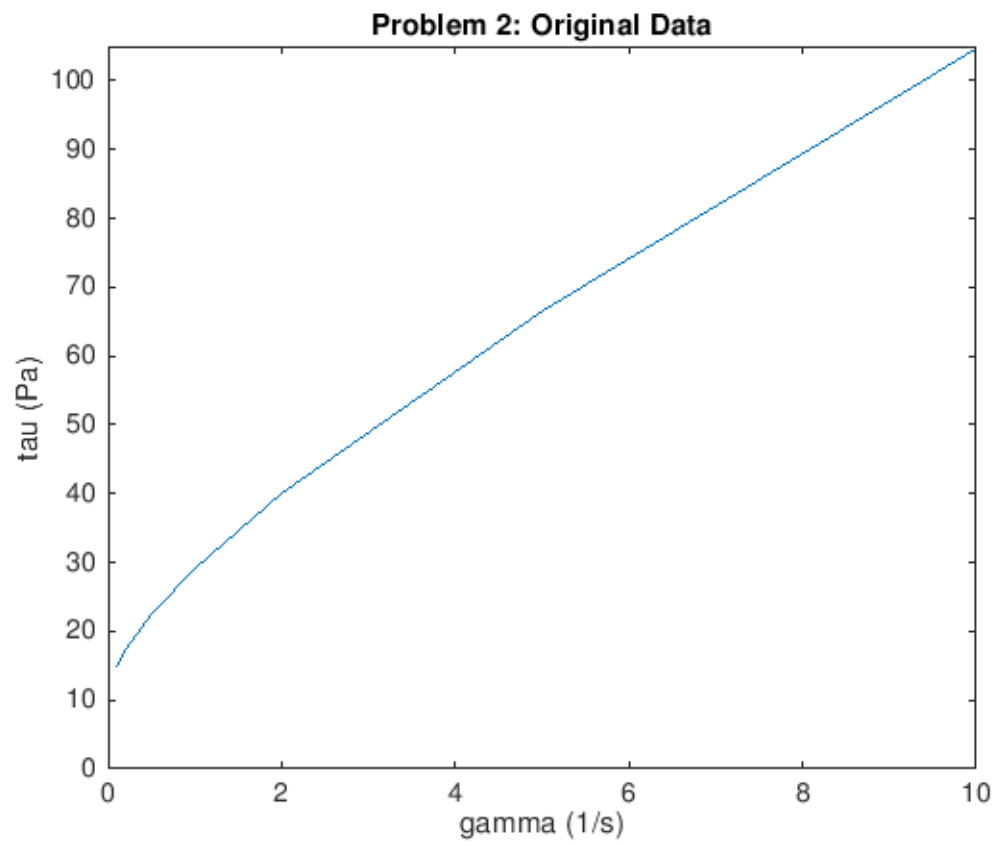
k_milk = exp(p(1,2));
line = polyval(p,x);

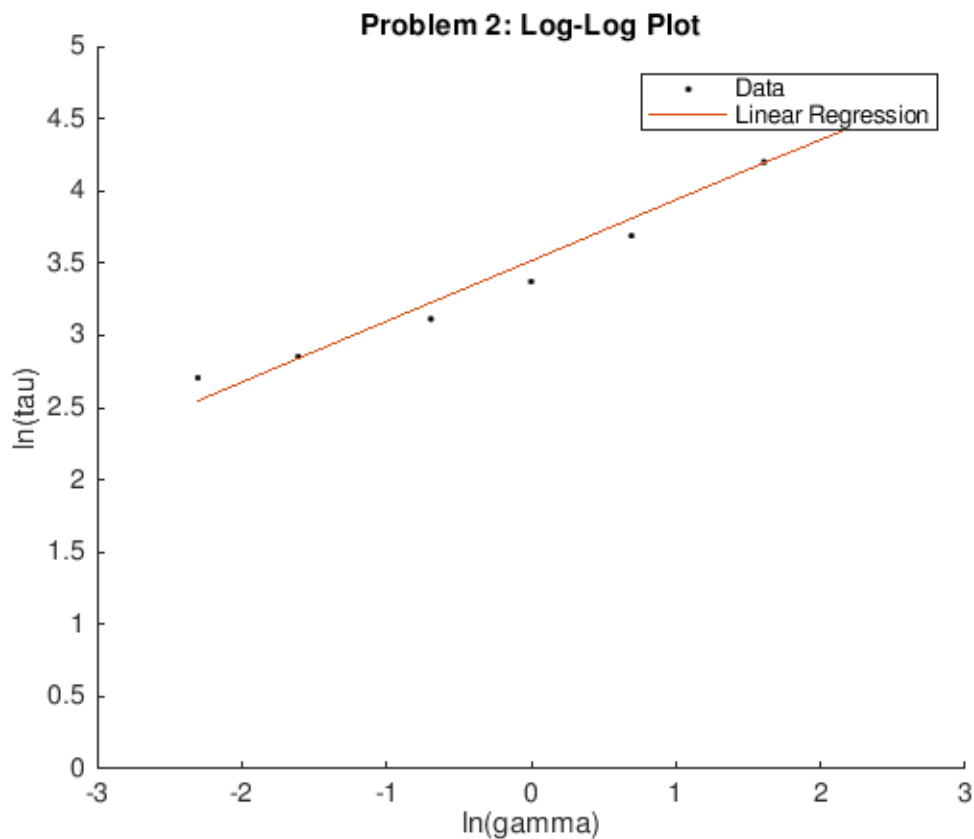
figure
scatter(x, y, '.k');
title('Problem 2: Log-Log Plot');
xlabel('ln(gamma)');
ylabel('ln(tau)');
ylim([0,5]);
hold on;
plot(x, line, '-');
legend('Data','Linear Regression');
hold off;

fprintf('Casson Body Model: tau = %f + %f * gamma ^ %f\n', tau_0_milk,
    k_milk, n_milk);
fprintf('tau_not = %f\n',tau_0_milk);
fprintf('k = %f\n', k_milk);
fprintf('n = %f\n\n', n_milk);

Problem 2:
Casson Body Model: tau = 14.000000 + 33.511826 * gamma ^ 3.511898
tau_not = 14.000000
k = 33.511826
n = 3.511898

```





## Problem 3

```
data = [-18.8, 14.4, 0.5; -18.8, 24.3, 1; -18.8, 141.9, 10; -18.8,
240.4, 20; -18.8, 327.2, 30; -18.8, 408.0, 40; -18.8, 483.9, 50;
-18.8, 555.9, 60; -18.8, 653.2, 70; -18.8, 692, 80; -5.4, 4.3, 0.6;
-5.4, 6.5, 1; -5.4, 38.4, 10; -5.4, 65.4, 20; -5.4, 88.7, 30; -5.4,
111.1, 40; -5.4, 131.9, 50; -5.4, 151.7, 60; -5.4, 171.3, 70; -5.4,
189, 80; 9.5, 2.6, 1.1; 9.5, 10.3, 8; 9.5, 17.1, 15; 9.5, 29.5, 30;
9.5, 50.3, 60; 9.5, 69.4, 90; 9.5, 103.3, 150; 9.5, 153.8, 250; 9.5,
200, 350; 9.5, 243, 450; 29.2, 3.6, 8; 29.2, 7.6, 20; 29.2, 13.1, 40;
29.2, 17.5, 60; 29.2, 31.2, 120; 29.2, 54.5, 240; 29.2, 94.4, 480;
29.2, 141.7, 800; 29.2, 170, 1000; 29.2, 183, 1100];
```

```
tau_orangejuice_1 = data(1:10,2);
gamma_orangejuice_1 = data(1:10,3);
tau_orangejuice_2 = data(11:20,2);
gamma_orangejuice_2 = data(11:20,3);
tau_orangejuice_3 = data(21:30,2);
gamma_orangejuice_3 = data(21:30,3);
tau_orangejuice_4 = data(31:40,2);
gamma_orangejuice_4 = data(31:40,3);
```

```
figure
scatter(gamma_orangejuice_1,tau_orangejuice_1, '.b')
```

---

```

hold on;
scatter(gamma_orangejuice_2,tau_orangejuice_2, '*b')
hold on;
scatter(gamma_orangejuice_3,tau_orangejuice_3, '+b')
hold on;
scatter(gamma_orangejuice_4,tau_orangejuice_4, '^b')
hold off;
title('Problem 3: Original Data');
xlabel('gamma (1/s)');
ylabel('tau (Pa)');
legend('T = -18.8C', 'T= -5.4C', 'T= 9.5C', 'T = 29.2C');

x = log(gamma_orangejuice_1);
y = log(tau_orangejuice_1);
p = polyfit(x,y,1);
n_oj_1 = p(1,2);
k_oj_1 = exp(p(1,2));
line = polyval(p,x);

figure
scatter(x, y, '.k');
title('Problem 3: Log-Log Plot, T = -18.8C');
xlabel('ln(gamma)');
ylabel('ln(tau)');
hold on;
plot(x, line, '-');
legend('Data','Linear Regression');
hold off;

fprintf('T = -18.8C Model: tau = %f * gamma ^ %f\n', k_oj_1, n_oj_1);
fprintf('K_0 + e^(E/RT) = %f\n', k_oj_1);
fprintf('n = %f\n', n_oj_1);

x = log(gamma_orangejuice_2);
y = log(tau_orangejuice_2);
p = polyfit(x,y,1);
n_oj_2 = p(1,2);
k_oj_2 = (p(1,2));
line = polyval(p,x);

figure
scatter(x, y, '.k');
title('Problem 3: Log-Log Plot, T = -5.4C');
xlabel('ln(gamma)');
ylabel('ln(tau)');
hold on;
plot(x, line, '-');
legend('Data','Linear Regression');
hold off;

fprintf('T = -5.4C Model: tau = %f * gamma ^ %f\n', k_oj_2, n_oj_2);
fprintf('K_0 + e^(E/RT) = %f\n', k_oj_2);
fprintf('n = %f\n', n_oj_2);

```

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---

```

x = log(gamma_orangejuice_3);
y = log(tau_orangejuice_3);
p = polyfit(x,y,1);
n_oj_3 = p(1,2);
k_oj_3 = (p(1,2));
line = polyval(p,x);

figure
scatter(x, y, '.k');
title('Problem 3: Log-Log Plot, T = 9.5C');
xlabel('ln(gamma)');
ylabel('ln(tau)');
hold on;
plot(x, line, '-');
legend('Data','Linear Regression');
hold off;

fprintf('T = 9.5C Model: tau = %f * gamma ^ %f\n', k_oj_3, n_oj_3);
fprintf('K_0 + e^(E/RT) = %f\n', k_oj_3);
fprintf('n = %f\n', n_oj_3);

x = log(gamma_orangejuice_4);
y = log(tau_orangejuice_4);
p = polyfit(x,y,1);
n_oj_4 = p(1,2);
k_oj_4 = (p(1,2));
line = polyval(p,x);

figure
scatter(x, y, '.k');
title('Problem 3: Log-Log Plot, T = 29.9C');
xlabel('ln(gamma)');
ylabel('ln(tau)');
hold on;
plot(x, line, '-');
legend('Data','Linear Regression');
hold off;

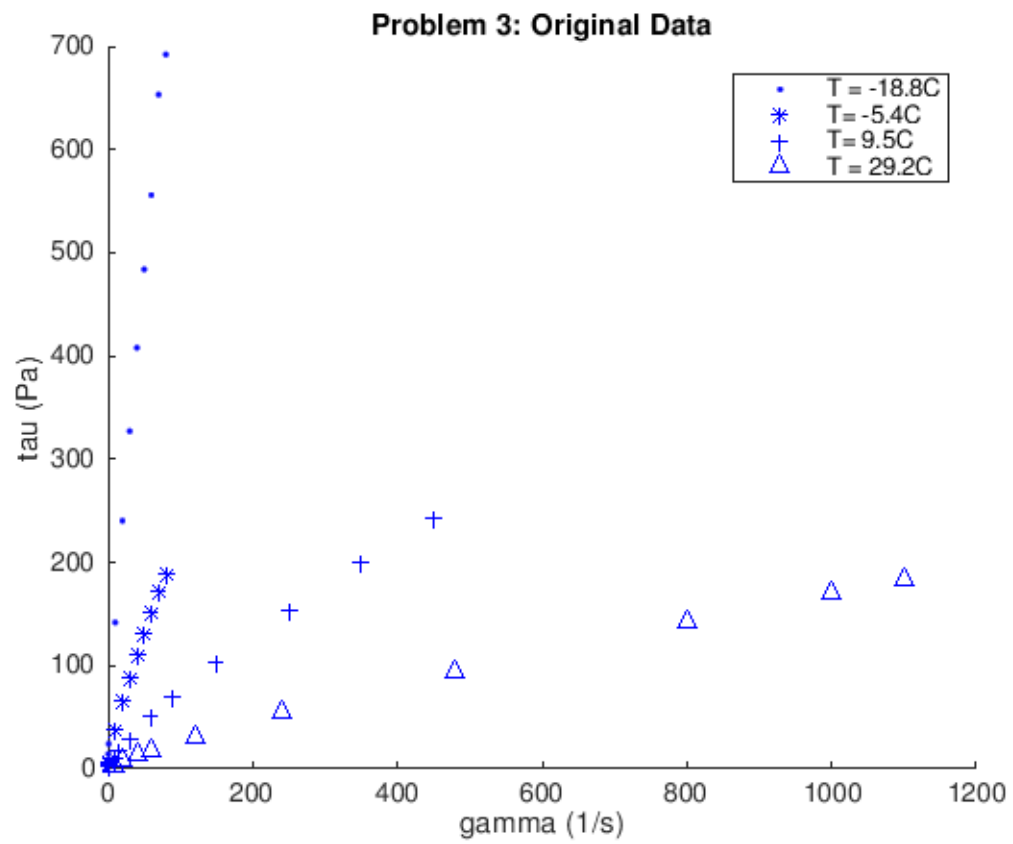
fprintf('T = 29.2C Model: tau = %f * gamma ^ %f\n', k_oj_4, n_oj_4);
fprintf('K_0 + e^(E/RT) = %f\n', k_oj_4);
fprintf('n = %f\n', n_oj_4);

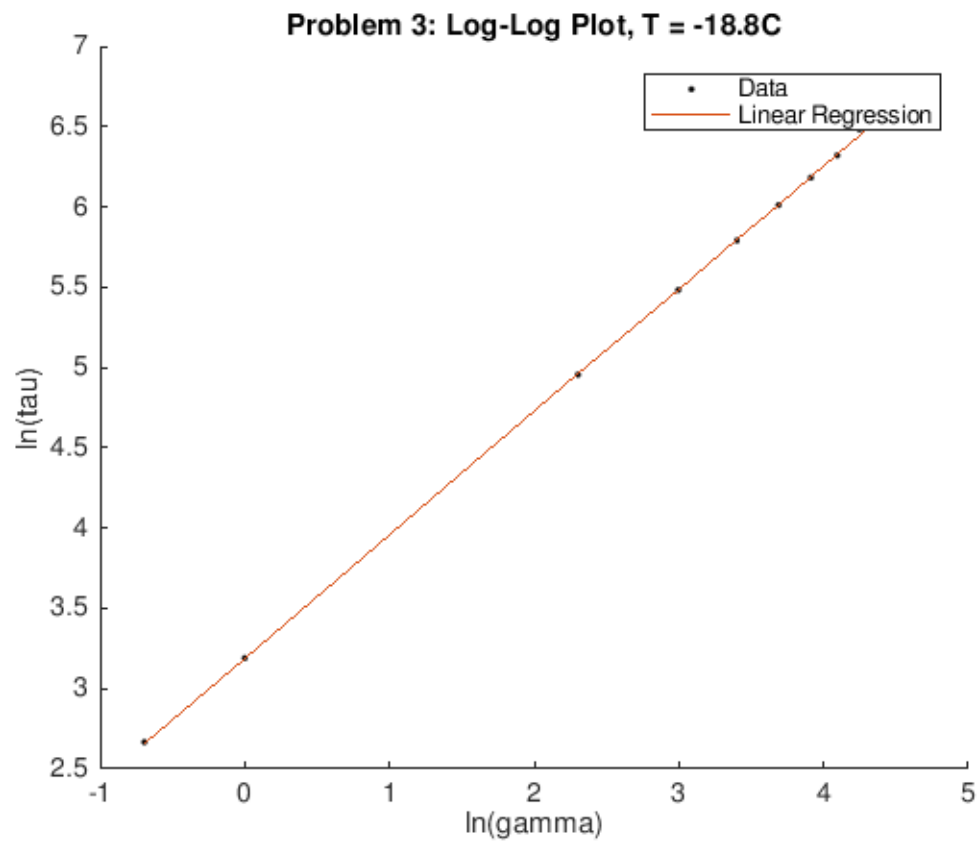
T = -18.8C Model: tau = 24.352005 * gamma ^ 3.192614
K_0 + e^(E/RT) = 24.352005
n = 3.192614
T = -5.4C Model: tau = 1.863691 * gamma ^ 1.863691
K_0 + e^(E/RT) = 1.863691
n = 1.863691
T = 9.5C Model: tau = 0.808793 * gamma ^ 0.808793
K_0 + e^(E/RT) = 0.808793
n = 0.808793
T = 29.2C Model: tau = -0.375537 * gamma ^ -0.375537
K_0 + e^(E/RT) = -0.375537
n = -0.375537

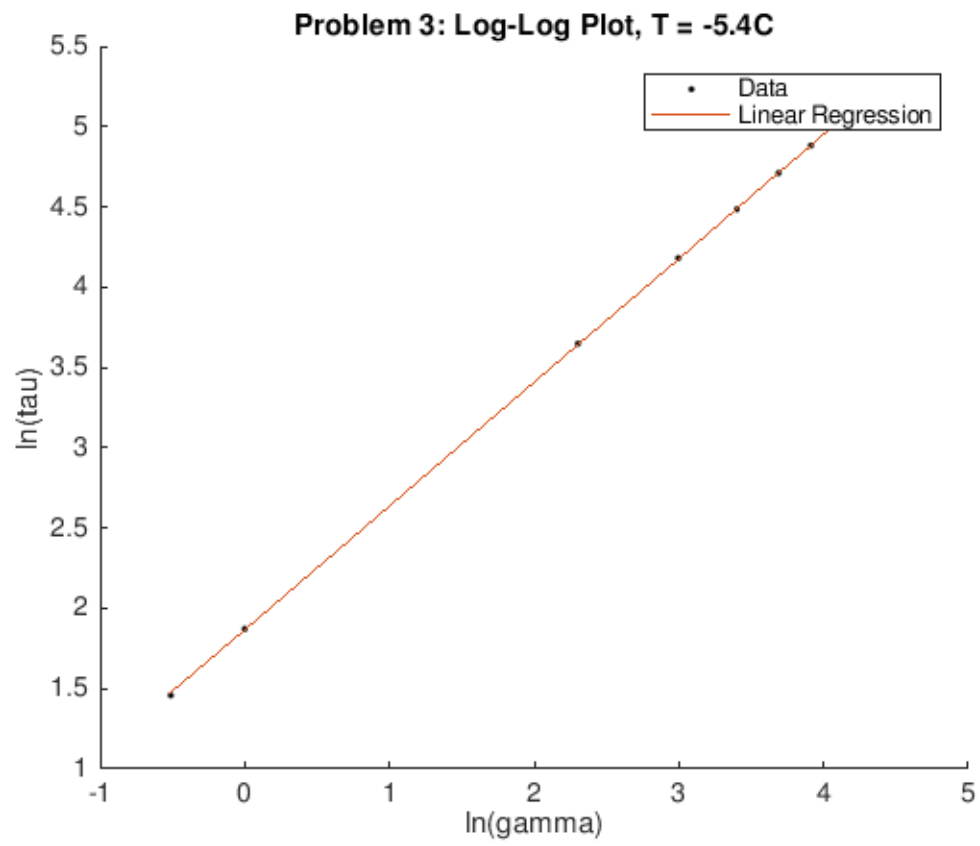
```

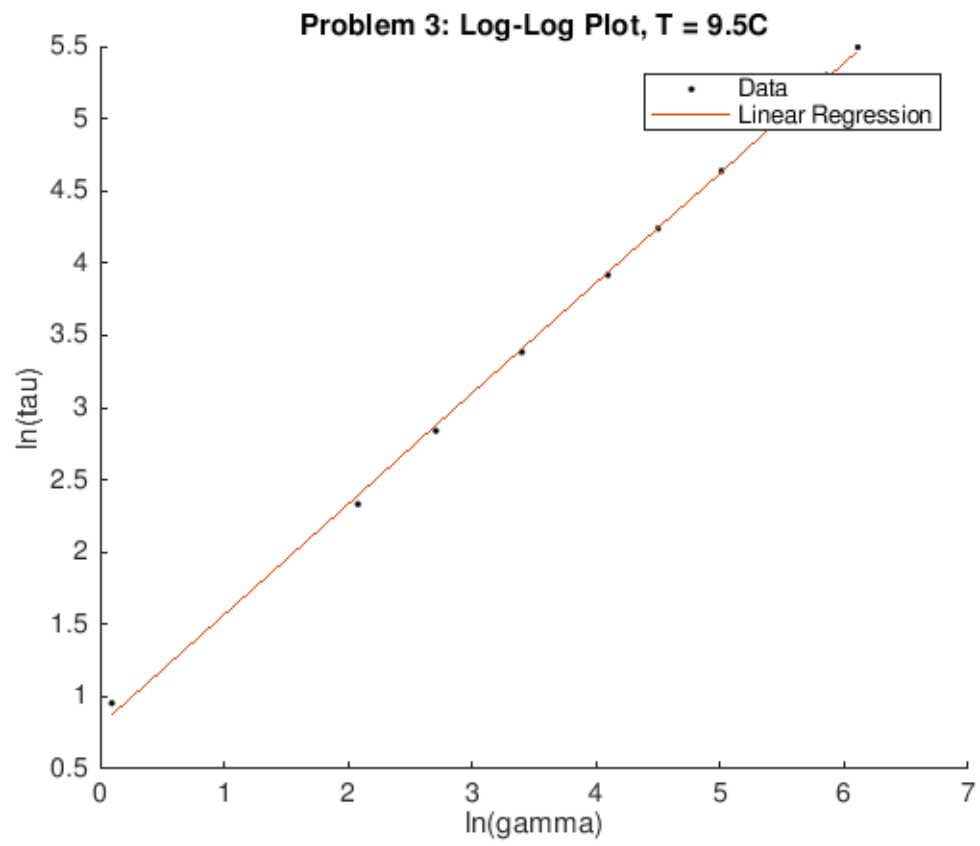
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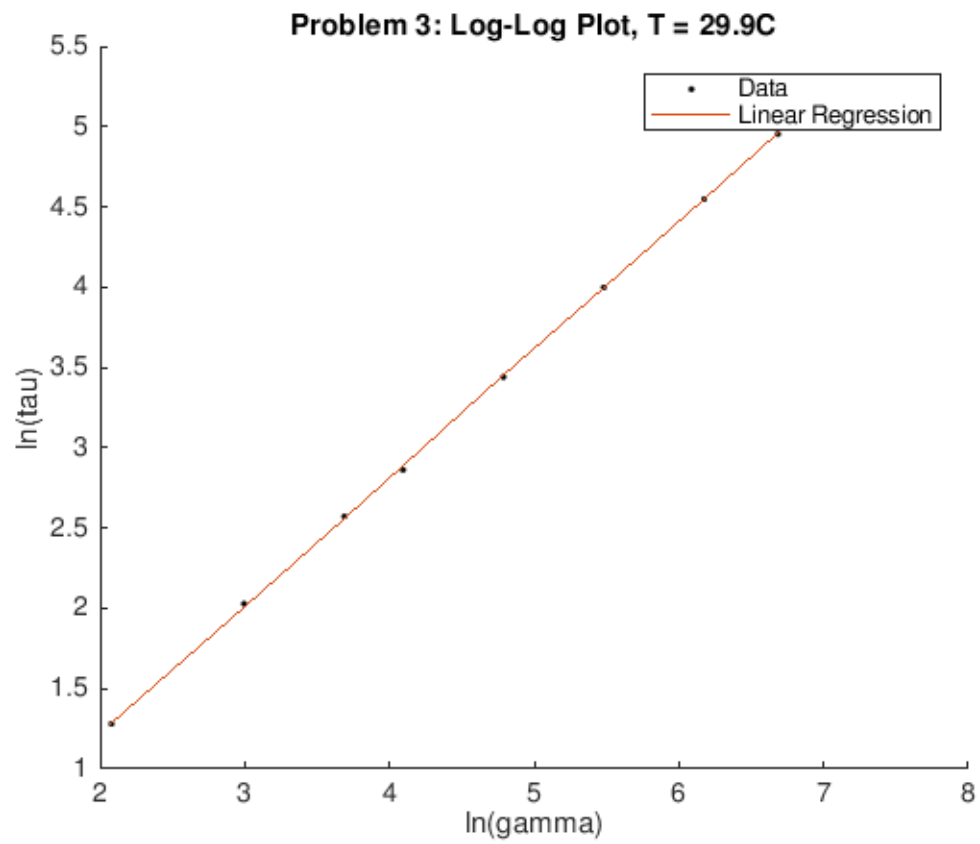












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