21 April 2019

To: CBEE 213 Class From: Professor Koretsky

Subject: Homework #4

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Below is the fourth homework assignment of the quarter. This assignment is due 3 May 2019 (Friday) by 5 PM on Gradescope. You will submit one file with your computer work and another file where you report your answers. Please conform to the updated format described on the class web site.

<http://classes.engr.oregonstate.edu/cbee/spring2019/cbee213-010/HWFormat.pdf> If you have any questions, feel free to see me or one of the other instructors during office hours or by appointment.

**4. The following heat capacity data, in [J/mol/K] vs. temperature, in [K] have been measured for *n*butane (Chen S.S., 1975).**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **cP** | **[J/mol/K]** | **38.07** | **55.35** | **67.32** | **76.44** | **92.3** | **98.49** | **98.95** | **124.77** | **148.66** | **169.28** |
| **T** | **[K]** | **50** | **100** | **150** | **200** | **273.15** | **298.15** | **300** | **400** | **500** | **600** |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **cP** | **[J/mol/K]** | **187.02** | **202.38** | **215.73** |
| **T** | **[K]** | **700** | **800** | **900** |

**A. Using the matrix method in MATLAB, fit these data to a polynomial expression of the form:**

**cP = A+ BT +CT2**

Here are the polynomial coefficients I found from MatLab:

A= 24.7

B= 0.2787

C=

\*Below is my MatLab script:

%preamble

clear all; close all; clc;

%load data (Cp and temperature)

load('p4\_data.mat')

%Calculate Beta (B\_1 and B\_0) value

Beta=((Temp'\*Temp)^-1)\*(Temp'\*Cp);

%input value for regression coefficient

B\_2=Beta(1)

B\_1=Beta(2)

B\_0=Beta(3)

%Fiding estimated Cp value (Cp\_hat)

Cp\_hat=B\_2\*((temp).^2)+B\_1\*temp+B\_0;

%Finding SST and SSE

SST=sum((Cp-mean(Cp)).^2);

SSE=sum((Cp-Cp\_hat).^2);

%Calculate sigma

sigma=sqrt(SSE/(length(temp)-2))

%calculate R square value

R\_square=1-(SSE/SST)

Firstly, I input the 13x1 Cp array, 13x1 temperature array (first column is temperature and the second one is , and the 13x3 temperature arrary

1. **Calculate the sum of the square error σˆ , and R2.**

1. **How do your results compare with those published in the literature?**