Contents


```
% Name          : Kai Chuen Tan
% Title         : Homework 2
% Course        : CSE 276C: Mathematics for Robotics
% Professor     : Dr. Henrik I. Christensen
% Date          : 17th October 2021

clear all;
clc;

fprintf('Name          : Kai Chuen Tan\n')
fprintf('Title         : Homework 2\n')
fprintf('Course        : CSE 276C: Mathematics for Robotics\n')
fprintf('Professor     : Dr. Henrik I. Christensen\n')
fprintf('Date          : 21st October 2021\n\n')
fprintf('------------------------------------------------------------\n\n')
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Problem 4 - Lagrange's Method

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fprintf('Problem 4 - Lagrange''s Method\n')
fprintf('-------------------------------\n\n')

% Planets' distance from the sun, s [10^6 km]
% [Mercury, Venus, Earth, Mars, Jupiter] (left to right)
s = [58, 108, 149.5, 227, 778];
s_Uranus = 2952.4;

% Days in a Planet Year, T [days]
% [Mercury, Venus, Earth, Mars, Jupiter] (left to right)
T = [88, 224.7, 365.3, 687, 4331.5];

% Applying Vandermonde Matrix and Lagrange Polynomial to get the Lagrange
% Funcion / Equation [a_o, a_1, a_2,..., a_n]
[fx_Lagrange_coeffs] = Lagrange_Method_Eq(s,T);

% Lagrange Function Check
fx = @(x, coeffs) coeffs(1) + coeffs(2) * x + coeffs(3) * x^2 + coeffs(4) * x^3 + coeffs(5) * x^4;

% Test Lagrange function that calculate the Days in a planet year, T [days]
T_Mars = fx(s(4), fx_Lagrange_coeffs);

T_Earth = fx(s(3), fx_Lagrange_coeffs);

T_Uranus = fx(s_Uranus, fx_Lagrange_coeffs);

% Print Lagrange Function.
fprintf('The Lagrange Function is:\n\n')
fprintf('f(x) = %.4e x%c + %.4e x%c + %.4e x%c + %.4f x + %.4f\n\n',...
    fx_Lagrange_coeffs(end),8308, fx_Lagrange_coeffs(4), 179, fx_Lagrange_coeffs(3), 178, fx_Lagrange_coeffs(2), fx_Lagrange_coeffs(1))

% Print results
fprintf('Given the Mars'' distance from the Sun is %.2f million kilometers,\nthe number of days in the planet year is %.2f days.\n\n',...
    s(4), T_Mars)

fprintf('Given the Earth''s distance from the Sun is %.2f million kilometers,\nthe number of days in the planet year is %.2f days.\n\n',...
    s(3), T_Earth)

fprintf('Given the Uranus''s distance from the Sun is %.2f million kilometers,\nthe number of days in the planet year is %.2f days.\n\n',...
    s_Uranus, T_Uranus)
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The Lagrange Function is:

f(x) = 8.7460e-10 x⁴ + -4.8243e-06 x³ + 8.6092e-03 x² + 1.4054 x + -21.5437

Given the Mars' distance from the Sun is 227.00 million kilometers,
the number of days in the planet year is 687.00 days.

Given the Earth's distance from the Sun is 149.50 million kilometers,
the number of days in the planet year is 365.30 days.

Given the Uranus's distance from the Sun is 2952.40 million kilometers,
the number of days in the planet year is 21470.83 days.
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