

MATLAB CODE AND RESULTS

This portion of the homework details the matlab cvx code used to optimize the problem presented in A6.8. This will be broken into a code section and a results section.

Code

The following MATLAB code was used to optimize the spline problem:

```
%%  
% File: Homework_2.m  
%  
% Author: Thomas Kost  
%  
% Date: 7 January 2022  
%  
% @brief homework 2 matlab problem concerning cubic splines  
%  
clear all, clc, close all;  
  
% Import data  
[t, y] = spline_data;  
% Generate splines  
%% 5b: splines  
M=10;  
alphas = [0:1:10];  
% Create A, b, G, h  
A = zeros(length(t), M+3);  
b = y;  
G = zeros(length(t), M+3);  
h = zeros(length(t), 1);  
% Construct A  
for i = 1:length(t)  
    u = t(i);  
    [g, gp, gpp] = bsplines(u);  
    A(i,:) = g;  
end  
% Construct G  
for i = 1:length(alphas)  
    [g, gp, gpp] = bsplines(alphas(i));  
    G(i,:) = gpp;  
end  
  
% Optimize  
cvx_begin
```

```

        variable x(M+3)
        minimize(norm(A*x-b,2))
        subject to
            G*x >=h
cvx_end

%% Plot Result
spline_plot = figure();
hold on
plot(t, A*x)
plot(t,y)
title("Problem 5: A6.8b")
xlabel("t");
ylabel("f(t)");
legend(["Optimal Spline", "Raw Data"])
hold off
saveas(spline_plot, "optimal_splines.jpg")

```

Results

The following plot was generated showing the optimal spline given the provided data.

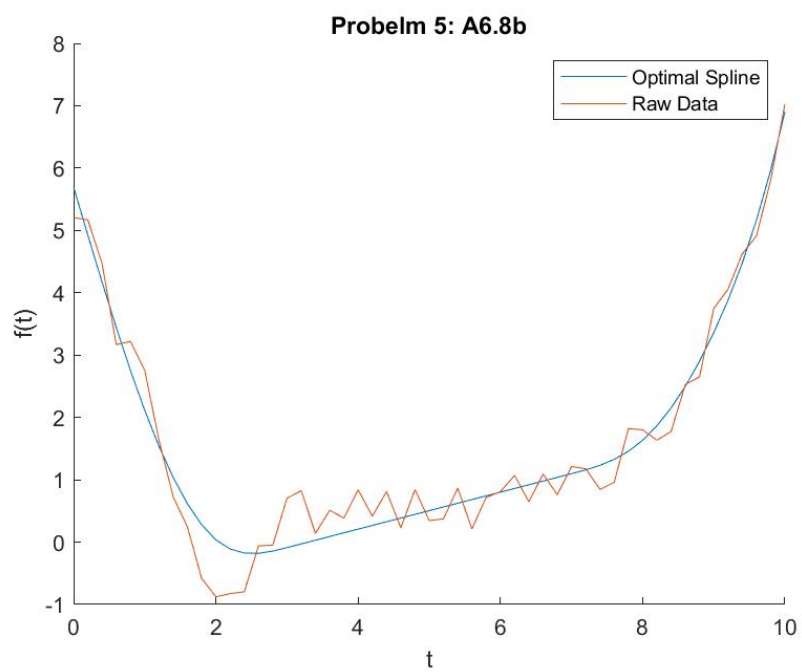


Figure 1: Optimal spline