

Sample Solutions of HW of Chapter 7: Interpolations

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Note that, the solutions are for your reference only. If you have any doubts about the correctness of the answers, please let the instructor and the TA know. More importantly, like other math questions, the homework questions may be solved in various ways. Do not assume that the sample solutions here are the only *correct* answers; discuss with others about alternate solutions.

We will not grade your homework assignment, but you are highly encouraged to discuss with us during the Lab hours. The correlation between the homework assignments and quiz/midterm/final questions is high. So you do want to practice more and sooner.

1 Computer Problem

- 7.7

(a)
(b)

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function cp07_07 % interpolation of gamma function
t = (1:5)'; y = [1; 1; 2; 6; 24]; p = polyfit(t,y,8); pp = spline(t,
    y);
ts = linspace(0,5,100)'; yr = gamma(ts); yp = polyval(p,ts); ys =
    ppval(pp,ts);
figure; hold on; plot(t,y,'ko',ts,yr,'k-',ts,yp,'b--',ts,ys,'r-.');
title('Computer_Problem_7.7(a)-(c)_--_Interpolants_to_Gamma_
    Function'); xlabel('t');
ylabel('y'); legend('data_points','gamma_function','polynomial','
    spline','Location','NorthWest');
ts = linspace(1,2,100)'; yr = gamma(ts); yp = polyval(p,ts); ys =
    ppval(pp,ts);
figure; plot(t(1:2),y(1:2),'ko',ts,yr,'k-',ts,yp,'b--',ts,ys,'r-.')
;
title('Computer_Problem_7.7(d)_--_Interpolants_to_Gamma_Function');
    xlabel('t');
ylabel('y'); legend('data_points','gamma_function','polynomial','
    spline','Location','SouthEast');
```

(c) From the figure 1, we can observe that the polynomial interpolation has less error than spline.

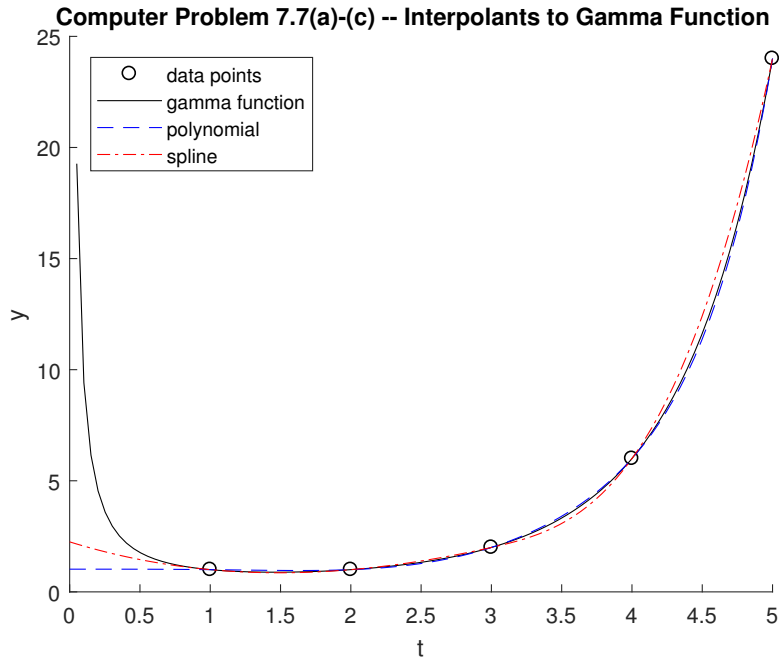


Figure 1: a-c

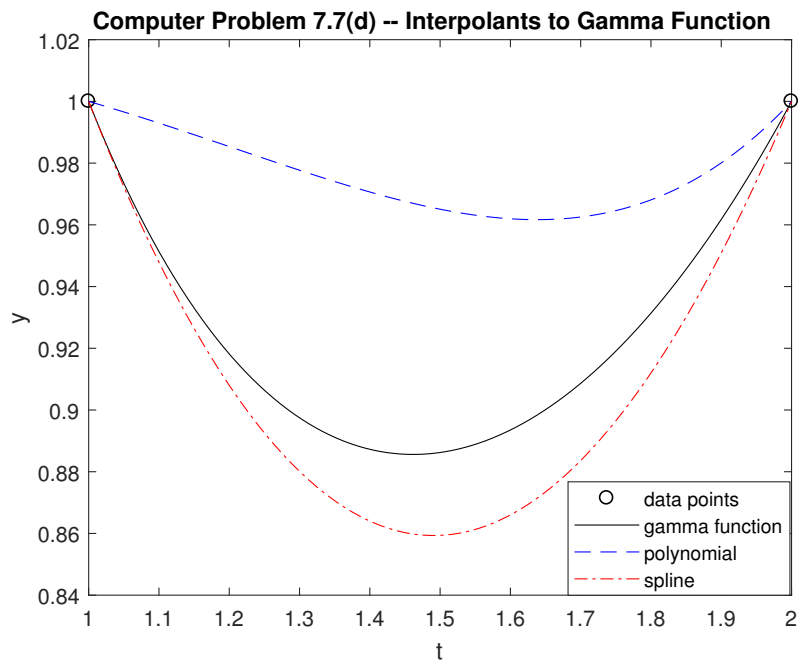


Figure 2: d

- (d) Although in the Figure 1 polynomial interpolation has less total error in $[1, 5]$, Figure 2 shows that spline has less error than polynomial interpolation in $[1, 2]$.