Numerical Analysis Homework 2 Programming Report

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Problem B

$\mathrm{n} = 2 : 1 - 0.0384615x^2$

$\mathrm{n} = 4 : 1 - 0.171088x^2 + 0.00530504x^4$

$\mathrm{n} = 6 : 1 + 2.77556e^{-17}x - 0.351364x^2 + 0.0335319x^4 + 8.67362e^{-19}x^5 - 0.000840633x^6$

$\mathrm{n} = 8 : 1 + 2.77556e^{-17}x - 0.528121x^2 - 6.93889e^{-17}x^3 + 0.0981875x^4 - 0.00658016x^6 + 0.000137445x^8$

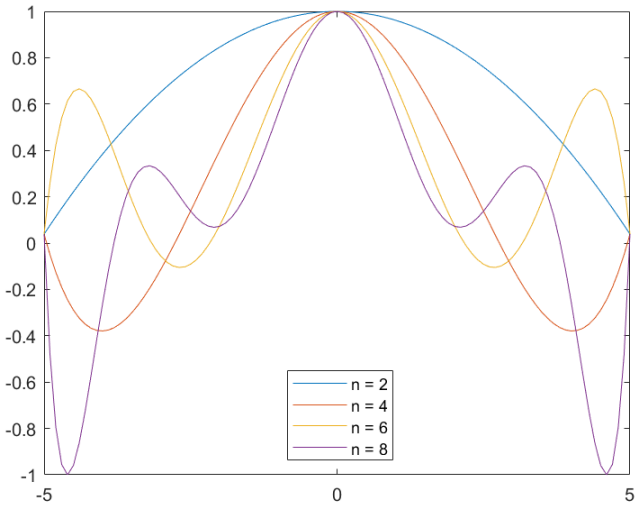

Figure 1: Runge Phenomenon

Problem C

$$\text{n} = 5 : \ 1 + 2.22045e^{-16}x^1 - 3.54298x^2 + 2.7465x^4$$

$$\text{n} = 10 : \ 0.730822 - 2.63684e^{-15}x - 4.81162x^2 + 3.06605e^{-14}x^3 + 12.6193x^4 - 5.5704e^{-14}x^5 - 14.0024x^6 + 9.10478e^{-14}x^7 + 5.51277x^8 - 3.64196e^{-14}x^9$$

$$\text{n} = 15 : \ 1+1.4988e^{-15}x-17.3641x^2-7.10543e^{-15}x^3+149.027x^4+3.69482e^{-13}x^5-646.864x^6+1.76215e^{-12}x^7+1510.61x^8+2.84217e^{-12}x^9-1927.18x^{10}-9.09495e^{-13}x^11+1264.42x^12 - 5.68434e^{-14}x^13 - 333.619x^14$$

$$\text{n} = 20 : \ 0.96241 + 1.33568e^{-15}x - 16.5422x^2 + 6.65006e^{-14}x^3 + 165.458x^4 - 1.95768e^{-12}x^5-960.825x^6-1.72285e^{-11}x^7+3379.02x^8-7.60981e^{-11}x^9-7413.45x^{10}-6.12795e^{-11}x^{11} + 10195.5x^{12} - 1.17966e^{-10}x^{13} - 8534.89x^{14} + 3.93281e^{-12}x^{15} + 3973.16x^{16} - 1.66573e^{-11}x^{17} - 788.326x^{18} + 3.19307e^{-12}x^{19}$$

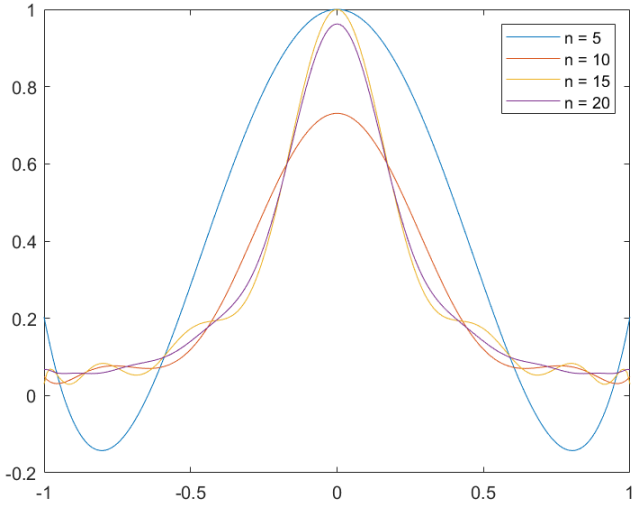

Figure 2: The Chebyshev interpolation is free of the wide oscillations in Runge Phenomenon

Problem D

(a) When t = 10s, Position is at 742.503ft with a speed of 48.3817ft/s.
(b) Speed of car every second is as follows :
75 74.6922 73.5827 77 79.2711 80 81.1029 80.8721 74 59.1577 48.3817 65.1861 110.976 72
As we can see, the car exceeds the speed limit when t = 12

Problem E

(a) Sample 1 :
$6.67-43.0127x+16.2855x^2-2.11512x^3+0.128281x^4-0.00371557x^5+4.1477e^{-5}x^6$
Sample 2 :
$6.67 - 5.85018x + 2.98227x^2 - 0.424283x^3 + 0.0265858x^4 - 0.000777473x^5 + 8.6768e^{-6}x^6$

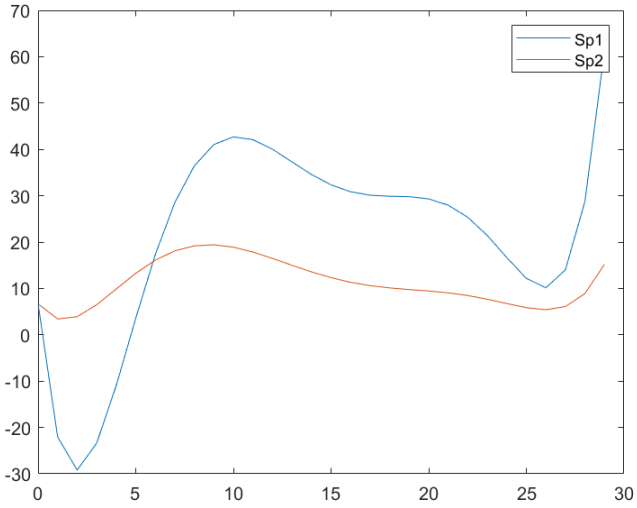

Figure 3: Average Weight Curve for Both Samples

(b) After another 15 days, the weight of Sample 1 is 14640.3, and the weight of Sample 2 is 2981.48, which are illogical weights for larvae. This implies that both of the larvae are dead.