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1. $\omega_5(0.75) = 0.7317$

$f(0.698) = 0.7661$

$f(0.733) = 0.7432$

$f(0.768) = 0.7193$

$f(0.803) = 0.6946$

degree 1:

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$$f(x) = 0.7661 \cdot \frac{(x-0.733)}{(0.698-0.733)} + 0.7432 \cdot \frac{(x-0.698)}{(0.733-0.698)}$$

$$f(0.75) \approx 0.7321 \#$$

$$\text{error} = |0.7321 - 0.7317| = 0.0004$$

$$|f(x) - P_1(x)| \leq \frac{M}{2!} \cdot |(x-x_0)(x-x_1)|$$

$$\text{error bound} = \frac{1}{2} \cdot |(0.75-0.698)(0.75-0.733)| = 4.42 \cdot 10^{-4} \#$$

degree 2:

$$f(x) = 0.7661 \cdot \frac{(x-0.733)(x-0.768)}{(0.698-0.733)(0.698-0.768)} + 0.7432 \cdot \frac{(x-0.698)(x-0.768)}{(0.733-0.698)(0.733-0.768)} + 0.7193 \cdot \frac{(x-0.698)(x-0.733)}{(0.768-0.698)(0.768-0.733)}$$

$$f(0.75) \approx 0.7317 \# \quad \text{error} = |0.7317 - 0.7317| = 0$$

$$|f(x) - P_2(x)| \leq \frac{M}{3!} \cdot |(x-x_0)(x-x_1)(x-x_2)|$$

$$\text{error bound} = \frac{1}{6} \cdot |(0.75-0.698)(0.75-0.733)(0.75-0.768)| = 2.657 \cdot 10^{-6} \#$$

degree 3:

$$f(x) = 0.7661 \cdot \frac{(x-0.733)(x-0.768)(x-0.803)}{(0.698-0.733)(0.698-0.768)(0.698-0.803)} + 0.7432 \cdot \frac{(x-0.698)(x-0.768)(x-0.803)}{(0.733-0.698)(0.733-0.768)(0.733-0.803)} + 0.7193 \cdot \frac{(x-0.698)(x-0.733)(x-0.803)}{(0.768-0.698)(0.768-0.733)(0.768-0.803)} \\ + 0.6946 \cdot \frac{(x-0.698)(x-0.733)(x-0.768)}{(0.803-0.698)(0.803-0.733)(0.803-0.768)}$$

$$f(0.75) \approx 0.7317 \#$$

$$|f(x) - P_3(x)| \leq \frac{M}{4!} \cdot |(x-x_0)(x-x_1)(x-x_2)(x-x_3)|$$

$$\text{error bound} = \frac{1}{24} \cdot |(0.75-0.698)(0.75-0.733)(0.75-0.768)(0.75-0.803)| = 3.51 \cdot 10^{-8} \#$$

degree 4:

只有三個點，算不出來

$$2. \quad y = x - e^{-x}$$

x	0.3	0.4	0.5	0.6	x
y	-0.440818	-0.27032	-0.16531	0.051188	0

$$X(y) = 0.3 \cdot \frac{(y+0.27032)(y+0.16531)(y-0.051188)}{(-0.440818+0.27032)(-0.440818+0.16531)(-0.440818-0.051188)} + 0.4 \cdot \frac{(y+0.440818)(y+0.16531)(y-0.051188)}{(-0.27032+0.440818)(-0.27032+0.16531)(-0.27032-0.051188)}$$

$$+ 0.5 \cdot \frac{(y+0.440818)(y+0.27032)(y-0.051188)}{(-0.16531+0.440818)(-0.16531+0.27032)(-0.16531-0.051188)} + 0.6 \cdot \frac{(y+0.440818)(y+0.27032)(y+0.16531)}{(0.051188+0.440818)(0.051188+0.27032)(0.051188+0.16531)}$$

$$\underline{X(0) \approx 0.5671426235} \#$$

3.

a.

$$D(0) = 768.96 \text{ feet}$$

$$V(0) = 74.64 \text{ ft/s}$$

b. 第一次超速, $V = 80.69 \text{ ft/s}$, $t = 3.15 \text{ s}$

$$C. V_{\max} = 92.04 \text{ ft/s}$$