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P282 6.4

$$1(d) \begin{cases} y' = 5t^4 y \\ y(0) = 1 \end{cases} \Rightarrow y(t) = e^{t^5} \Rightarrow y(1) = e = 2.71828$$

$$w_0 = 1$$

$$w_1 = 1 + \frac{1}{4} \cdot 5 \cdot \left(\frac{1}{8}\right)^4 \left(1 + \frac{1}{8} \cdot 5 \cdot 0^4 \cdot 1\right) = \frac{16389}{16384}$$

$$w_2 = \frac{16389}{16384} + \frac{1}{4} \cdot 5 \cdot \left(\frac{1}{4} + \frac{1}{8}\right)^4 \left(\frac{16389}{16384} + \frac{1}{8} \cdot 5 \cdot \left(\frac{1}{4}\right)^4 \frac{16389}{16384}\right) = \frac{563850465933}{549755813888}$$

$$w_3 = w_2 + \frac{1}{4} \cdot 5 \cdot \left(\frac{1}{2} + \frac{1}{8}\right)^4 \left(w_2 + \frac{1}{8} \cdot 5 \cdot \left(\frac{1}{2}\right)^4 w_2\right) \approx \frac{0}{1.2283}$$

$$w_4 = w_3 + \frac{1}{4} \cdot 5 \cdot \left(\frac{3}{4} + \frac{1}{8}\right)^4 \left(w_3 + \frac{1}{8} \cdot 5 \cdot \left(\frac{3}{4}\right)^4 w_3\right) \approx 2.3062$$

$$e = |w_4 - y(1)| \approx 0.412$$

$$3(d) \quad w_1 = 1 + \frac{1}{24} (5 \cdot 0^4 + 25(0 + \frac{1}{8})^4) \quad s_1 = 5t_i^4 w_i \quad s_2 = 5(t_i + \frac{1}{8})^4 (w_i + \frac{1}{8} s_1)$$

$$s_3 = 5(t_i + \frac{1}{8})^4 (w_i + \frac{1}{8} s_2) \quad s_4 = 5(t_i + \frac{1}{4})^4 (w_i + \frac{1}{4} s_3)$$

$$\therefore w_1 = w_0 + \frac{1}{24} (s_1 + 2s_2 + 2s_3 + s_4) \approx 1.0010$$

$$w_2 = w_1 + \frac{1}{24} (s_1 + 2s_2 + 2s_3 + s_4) \approx 1.0318$$

$$w_3 = w_2 + \frac{1}{24} (s_1 + 2s_2 + 2s_3 + s_4) \approx 1.2678$$

$$w_4 = w_3 + \frac{1}{24} (s_1 + 2s_2 + 2s_3 + s_4) \approx 2.71033$$

$$e = |w_4 - y(1)| \approx 0.00785$$