$$f(x) = P_n(x) + \underbrace{\frac{f^{(n+1)}(\xi)}{(n+1)!}(x-x_0)(x-x_1)\dots(x-x_n)}_{\text{error}}$$

exact — appr.

$$\Rightarrow \|f - P_3\| = \max_{0\le x\le 3} \left| \frac{f^{(4)}(\xi)}{4!}(x-x_0)(x-x_1)(x-x_2)(x-x_3) \right|$$

$$\le \frac{1}{4!}\left(\max_{0\le x\le 3} |e^{\xi}| = e^3\right) \max_{0\le x\le 3} \underbrace{e^{\xi}\,|(x-x_0)(x-x_1)(x-x_2)(x-x_3)|}$$

can plot to find max value

$$\|f - P_3\| = \max_{0\le x\le 3} |f(x) - P_3(x)|$$

$$\max_{0\le x\le 3} |f(x) - P_3(x)| = \max_{0\le x\le 3} \left| e^x - (0.8455x^3 - 1.060x^2 + 1.933x + 1) \right|$$

etc.

$$= \left| e^{(3)} - (0.8455(3)^3 - 1.060(3)^2 + 1.933(3) + 1) \right|$$

$$\approx |20.085537 - 20.0875|$$

$$= \boxed{0.001963}$$