3 d

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

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

$$= \max_{0 \le x \le 3} \left| \frac{1}{4!} e^{(\xi)} (x^4 - 6x^3 + 11x^2 - 6x) \right|$$

$$\longrightarrow \max_{0 \le x \le 3} |e^{(\xi)}| = e^3$$

$$\max_{0 \le x \le 3} \underbrace{|x^4 - 6x^3 + 11x^2 - 6x|}_{g(x)}$$

$$g'(x) = 4x^3 - 18x^2 + 22x - 6$$

$$\longrightarrow \max_{0 \le x \le 3} |f(x) - P_3(x)| = \max_{0 \le x \le 3} \left| \frac{e^3}{4!} g(x) \right| \approx 0.8369$$

FROM PLOT IN `3d.PY'