Q2. any $x \in \mathbb{F}$ can be represented as,

$$x = \pm(.d_1 \ldots d_t) \cdot \beta^E$$

the sign bit can only assume 2 values.
d_1 cannot assume 0. therefore it can only assume $\beta - 1$ values. but each of digits $d_2, d_3, \ldots d_t$ can assume β different values. therefore mantissa assumes $(\beta-1) \times \beta^{t-1}$ values.
Range of exponent is $[L, U]$ therefore exponent can assume $(U-L+1)$ values.

$\therefore$ number of elements, $= 2 \times (\beta-1)\beta^{t-1} \times (U-L+1)$

$\therefore$ set $\mathbb{F}$ contains $2(\beta-1)\beta^{t-1}(U-L+1)$ elements.

Q3. Taylor series.,

$$f(x) = \sum_{k=0}^{N} \frac{1}{k!} \cdot f^{(k)}(x_0)(x-x_0)^k + E_{N+1}(f, \xi)$$

where $E_{N+1}(f, \xi) = \frac{1}{(N+1)!} \cdot f^{(N+1)}(\xi)(x-x_0)^{N+1}$

$\therefore \quad f(x+h) = f(x) + h f'(x) + \frac{h^2}{2} \cdot f''(\xi)$ where $x < \xi < x+h$

$$f'(x) = \frac{f(x+h) - f(x) - h^2/_2 \cdot f''(\xi)}{h}$$

$$= \frac{f(x+h) - f(x)}{h} - \frac{h f''(\xi)}{2} = f_h'(x) - \frac{h \cdot f''(\xi)}{2}.$$

$$\therefore \quad E_h(x) = \left| f'(x) - f_h'(x) \right| = \left| h \cdot \frac{f''(\xi)}{2} \right|$$

$$\lim_{h \to 0} \frac{|E_h(x)|}{|h|} = \lim_{h \to 0} \frac{|f''(\xi)|}{2} = \frac{|f''(\xi)|}{2} = \text{constant.}$$

$\therefore \quad E_h = O(h)$