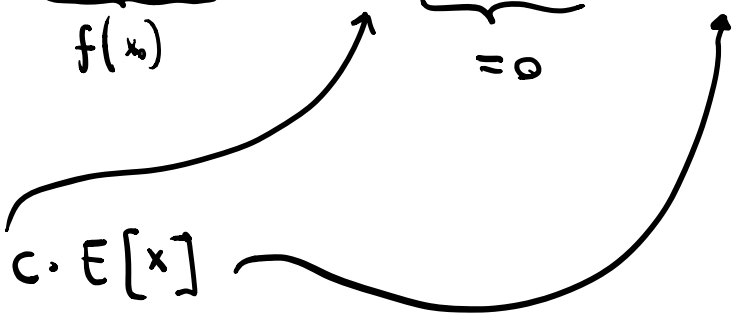$$f(x) = f(x_0) + f'(x_0)(x - x_0) + f''(x_0)(x - x_0)^2$$

$$E(f(x)) = \underbrace{E[f(x_0)]}_{f(x_0)} + f'(x)\underbrace{E[x - x_0]}_{=0} + f''(x_0)\underbrace{E[(x-x_0)^2]}_{\sigma^2}$$

$$E[c \cdot x] = c \cdot E[x]$$

1st order $\qquad E[f(x)] = f(x_0)$

2nd order $\qquad E[f(x)] = f(x_0) + f''(x_0)\sigma_x^2$

$$f(x) = a + bx + cx^2$$

$$f''(x) = 2c \gtrless 0$$