Applications of MVC

$(x-a)$

$$f(x) \approx \underbrace{f(a) + \frac{f'(a)}{1!}(x-a)}_{1^{st}} + \frac{f''(a)}{2!}(x-a)^2 + \frac{f'''(a)}{3!}(x-a)^3 + \cdots \text{H.O.T}$$

$(x=a)$

$$f(x) \approx f(a) + \underbrace{\frac{f'(a)}{1!}(x-a)}_{p'(x)}\Big]^{1^{st}}$$

$$f(x) \approx f(a) + p'(x) + \frac{f''(a)}{2!}(x-a)^2$$

$$f(x) \approx f(a) + \cdots + \frac{f^{(n)}(a)}{n!}(x-a)^n$$

Remark: $(x=0)$

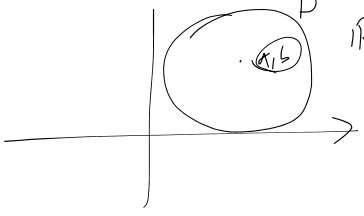
Maclaurin Series:

$$f(x) \approx f(0) + \frac{f'(0)}{1!}x + \frac{f''(0)}{2!}x^2 + \cdots$$

Taylors theorem for a function of two variables

(x, y) over a $\mathbb{R}^2$ $(a,b) \in D$

$x = a, \quad y = b$



$$f(x,y) \approx f(a,b) + \frac{1}{1!}\left[f_x(a,b)(x-a) + f_y(a,b)(y-b)\right] + \frac{1}{2!}\left[f_{xx}(a,b)(x-a)^2 + f_{yy}(a,b)(y-b)^2 + 2f_{xy}(a,b)(x-a)(y-b)\right]$$

$$\frac{1}{2!}\left[f_{xx}(a,b)(x-a)^2 + f_{yy}(a,b)(y-b)^2 + 2 f_{xy}(a,b)(x-a)(y-b) \right]$$

$$+ \frac{1}{3!}\Big[f_{xxx}(a,b)(x-a)^3 + f_{yyy}(a,b)(y-b)^3 + 3 f_{xxy}(a,b)(x-a)^2(y-b) + 3 f_{xyy}(a,b)(x-a)(y-b)^2 \Big] + \cdots$$