

Ponto 4

$$* \bullet f'(x) = \frac{-f(x+2h) + 4f(x+h) - 3f(x)}{2h}$$

$$\rightarrow x^2$$

$$f'(x^2) = \lim_{h \rightarrow 0} \frac{-x^2 + 4xh - \cancel{4h^2} + 4x^2 + 8xh + \cancel{4h^2} - 3x^2}{2h}$$

$$f'(x^2) = \lim_{h \rightarrow 0} \frac{4xh}{2h} = 2x$$

$$\rightarrow \sin x$$

$$f'(\sin x) = \lim_{h \rightarrow 0} \frac{-\sin(x+2h) + 4\sin(x+h) - 3\sin(x)}{2h}$$

$$= \lim_{h \rightarrow 0} \frac{-\sin(x)\cos(2h) - \cos(x)\sin(2h) + 4\sin(x)\cos(h)}{2h}$$

$$+ 4\cos(x)\sin(h) - 3\sin x$$

$$= \sin(x) \lim_{h \rightarrow 0} \frac{(-\cos(2h) + 4\cos(h) - 3)}{2h} + \cos(x) \lim_{h \rightarrow 0} (-\sin(2h)$$

$$+ 4\sin(h))$$

$$= \sin(x) \lim_{h \rightarrow 0} \frac{2\sin(2h) - 4\sin(h)}{2} + \cos(x) \lim_{h \rightarrow 0} \frac{-2\cos(2h) + 4\cos(h)}{2}$$

$$= \sin(x) (0) + \cos(x) \left(\frac{-2+4}{2} \right) = \cos(x)$$

$$\bullet f''(x) = \frac{f(x+h) - 2f(x) + f(x-h)}{h^2}$$

$$\rightarrow \sin(x)$$

$$f''(x^2) = \lim_{h \rightarrow 0} \frac{\sin(x+h) - 2\sin(x) + \sin(x-h)}{h^2}$$

$$f''(x^2) = \lim_{h \rightarrow 0} \frac{\sin(x)\cos(h) + \sin(h)\cos(x) - 2\sin(x) + \sin(x)\cos(h)}{h^2}$$

$$- \sin(h)\cos(x)$$

$$= \text{Sen}(x) \lim_{h \rightarrow 0} \frac{2\cosh - 2}{h^2} = \text{sen}(x) \lim_{h \rightarrow 0} \frac{-2\text{sen}h}{2h}$$

$$= \text{sen}(x) \lim_{h \rightarrow 0} \frac{-2}{2} = -\text{sen}(x)$$

$$\rightarrow x^2$$

$$f''(x^2) = \lim_{h \rightarrow 0} \frac{x^2 + 2xh + h^2 - 2x^2 + x^2 - 2xh + h^2}{h^2}$$

$$= \lim_{h \rightarrow 0} \frac{2h^2}{h^2} = 2$$