$f(x) = Sen(x)$

$f'(x) = Cos(x)$

$f''(x) = -Sen(x)$

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

$\lim_{h\to 0} \frac{-Sen(x+2(0)) + 4Sen(x+0) - 3Sen(x)}{2\cdot 0}$

Al evaluar da $\frac{\#}{0} = \infty$ entonces podemos usar L'Hopital

$\lim_{h\to 0} \frac{\frac{d}{dh}(-Sen(x-2h) + 4Sen(x+h) - 3Sen(x))}{\frac{d}{dh}(2h)}$

$\lim_{h\to 0} \frac{-2Cos(x-2h) + 4Cos(x+h)}{2}$

$\lim_{h\to 0} \frac{2(-Cos(x-2h) + 2Cos(x+h))}{2}$

$\lim_{h\to 0} -Cos(x-2h) + 2\lim_{h\to 0} Cos(x+h)$

$-Cos(\lim_{h\to 0} x-2h) + 2Cos(\lim_{h\to 0} x+h)$ evaluando $\lim_{h}$

$= -Cos(x) + 2Cos(x)$

$= Cos(x)$

1.) $f(x) = x^2$

$f'(x) = 2x$

$f''(x) = 2$

i) $f'(x) = \dfrac{-f(x+2h) + 4f(x+h) - 3f(x)}{2h}$

ii) $f''(x) = \dfrac{f(x+h) - 2f(x) + f(x-h)}{h^2}$

⇒ Con x^2

i) $= \dfrac{-([x+2h]^2) + 4([x+h]^2) - 3x^2}{2h}$

$= \dfrac{-(x^2 + 4xh + 4h^2) + 4(x^2 + 2xh + h^2) - 3x^2}{2h}$

$= \dfrac{-x^2 - 4xh - 4h^2 + 4x^2 + 8xh + 4h^2 - 3x^2}{2h}$

$= \dfrac{4xh}{2h} = 2x$

ii) $= \dfrac{(x+h)^2 - 2x^2 + (x-h)^2}{h^2}$

$= \dfrac{x^2 + 2xh + h^2 - 2x^2 + x^2 - 2xh + h^2}{h^2}$

$= \dfrac{2h^2}{h^2} = 2$

3.) $c = 3 \times 10^8$ m/s $\Rightarrow$ au/año

1 au = 149 597 870 700 m

1 año = 31 536 000 s

1m = 60s
1h = 60m
1d = 24h

$365\,d \cdot \frac{24\,h}{1\,d} \cdot \frac{60\,m}{1\,h} \cdot \frac{60\,s}{1\,m} = 31536000$

1) $3 \times 10^8 \frac{m}{s} \cdot \frac{1\,au}{149\,597\,870\,700\,m} \cdot \frac{31536000\,s}{1\,año} \approx 63241.51$ au/año

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$$f''(x) = \frac{Sen(x+h) - 2\,sen(x) + sen(x-h)}{h^2} \quad \overset{L.H}{=} \quad \frac{\#}{0}$$

$$\lim_{h\to 0} \frac{Cos(x+h) - Cos(x-h)}{2h} \quad \overset{L.H}{=} \quad \frac{\#}{0}$$

$$\lim_{h\to 0} \frac{-Sen(x+h) - Sen(x-h)}{2}$$

$$\frac{1}{2}\left[-Sen\left(\lim_{h\to 0} x+h\right) - sen\left(\lim_{h\to 0} x-h\right)\right]$$

$$\frac{1}{2}\left[-sen(x) - sen(x)\right]$$

$$\frac{1}{2}\left[-2sen(x)\right]$$

$$-sen(x)$$