

# Aproximación de derivadas con mayor exactitud y mayor orden para valores discretos

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$$f'(x_i) \cong \frac{f(x_{i+1}) - f(x_i)}{(x_{i+1} - x_i)}$$

$$f'(x_i) \cong \frac{f(x_i + h) - f(x_i)}{h} \quad \Rightarrow \quad f'(x_i) \cong \frac{f(x_{i+1}) - f(x_i)}{h}$$

Si los datos se encuentran equiespaciados podemos utilizar las expresiones que analizamos anteriormente

$$f'(x_0) = \frac{48f(x_0 + h) - 36f(x_0 + 2h) + 16f(x_0 + 3h) - 3f(x_0 + 4h) - 25f(x_0)}{12h}$$

$$f'(x_i) = \frac{48f(x_{i+1}) - 36f(x_{i+2}) + 16f(x_{i+3}) - 3f(x_{i+4}) - 25f(x_i)}{12h}$$

$$f'(x_0) = \frac{-3f(x_0 - h) + 18f(x_0 + h) - 6f(x_0 + 2h) + f(x_0 + 3h) - 10f(x_0)}{12h}$$

$$f'(x_i) = \frac{-3f(x_{i-1}) + 18f(x_{i+1}) - 6f(x_{i+2}) + f(x_{i+3}) - 10f(x_i)}{12h}$$

Tiempo (seg)	Distancia (m)	Velocidad (m/seg)	Aceleracion(m/seg <sup>2</sup> )
0	0		
2	17.41		
4	62.27		
6	126.17		
8	203.24		
10	289.44		
12	381.96		
14	478.86		
16	578.80		
18	680.84		
20	784.34		
22	888.85		
24	994.05		
26	1099.74		
28	1205.76		
30	1312.02		
32	1418.44		
34	1524.97		
36	1631.58		
38	1738.24		
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8	$f'(x_i) = \frac{48f(x_{i+1}) - 36f(x_{i+2}) + 16f(x_{i+3}) - 3f(x_{i+4}) - 25f(x_i)}{12h}$		
10			
12			
14	$f'(x_i) = \frac{-3f(x_{i-1}) + 18f(x_{i+1}) - 6f(x_{i+2}) + f(x_{i+3}) - 10f(x_i)}{12h}$		
16			
18			
20	$f'(x_i) = \frac{-8f(x_{i-1}) + f(x_{i-2}) + 8f(x_{i+1}) - f(x_{i+2})}{12h}$		
22			
24			
26	$f'(x_i) = \frac{3f(x_{i+1}) - 18f(x_{i-1}) + 6f(x_{i-2}) - f(x_{i-3}) + 10f(x_i)}{12h}$		
28			
30			
32	$f'(x_i) = \frac{-48f(x_{i-1}) + 36f(x_{i-2}) - 16f(x_{i-3}) + 3f(x_{i-4}) + 25f(x_i)}{12h}$		
34			
36			
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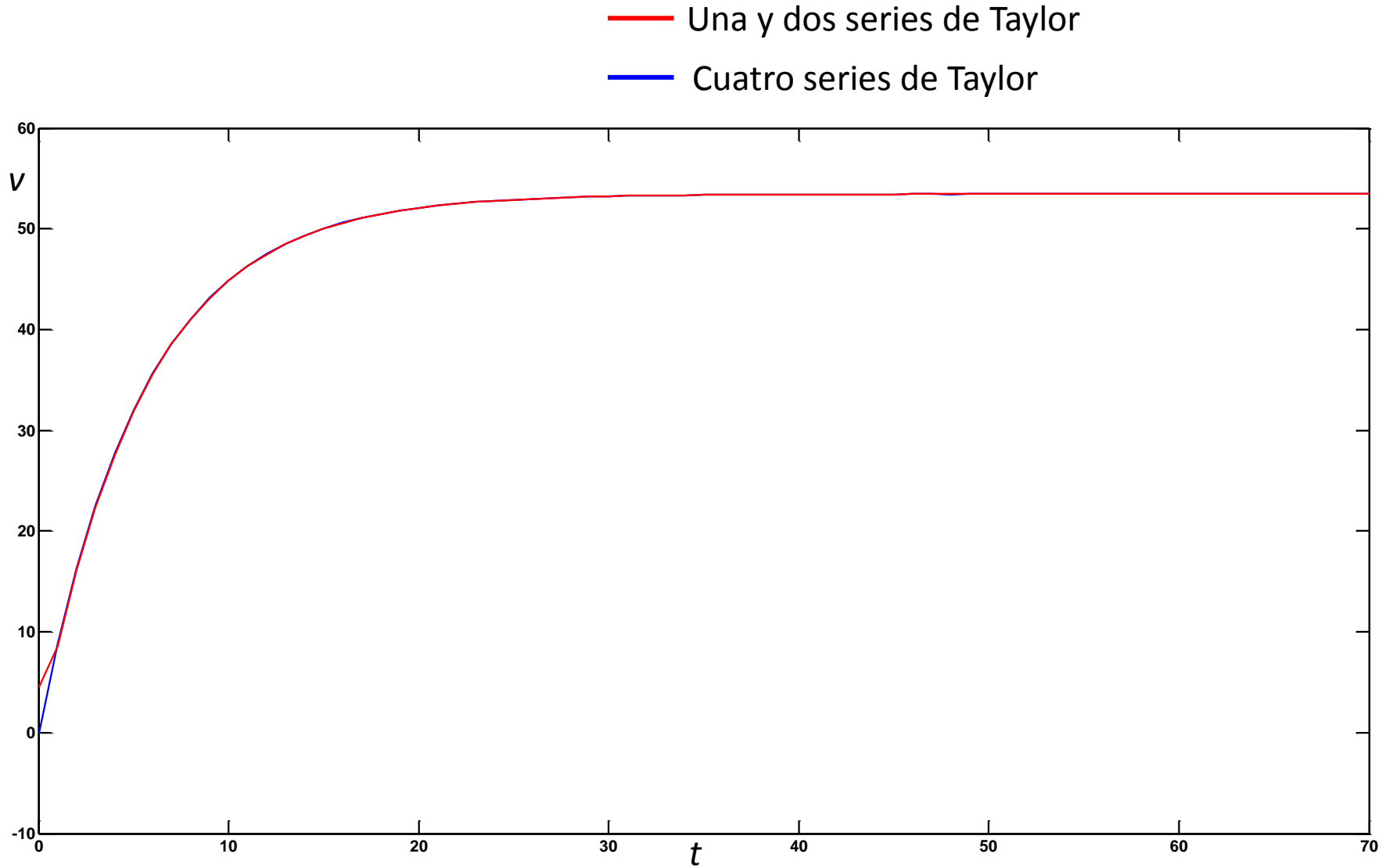
$$f''(x_i) = \frac{-104f(x_{i+1}) + 114f(x_{i+2}) - 56f(x_{i+3}) + 11f(x_{i+4}) + 35f(x_i)}{12h^2}$$

$$f''(x_i) = \frac{11f(x_{i-1}) + 6f(x_{i+1}) + 4f(x_{i+2}) - f(x_{i+3}) - 20f(x_i)}{12h^2}$$

$$f''(x_i) = \frac{16f(x_{i-1}) - f(x_{i-2}) + 16f(x_{i+1}) - f(x_{i+2}) - 30f(x_i)}{12h^2}$$

$$f''(x_i) = \frac{-11f(x_{i+1}) - 6f(x_{i-1}) - 4f(x_{i-2}) + f(x_{i-3}) + 20f(x_i)}{12h^2}$$

$$f''(x_i) = \frac{104f(x_{i-1}) - 114f(x_{i-2}) + 56f(x_{i-3}) - 11f(x_{i-4}) - 35f(x_i)}{12h^2}$$



— Una y dos series de Taylor  
— Cuatro series de Taylor

