L3 (1.3) First Principles & Rates of Change

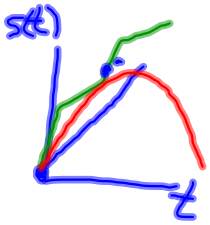
Recall the formula for First Principles:

$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

This can represent

- the derivative of a function
- the slope of any tangent line on the original curve
- the instantaneous rate of change at any point on the original curve
- and now.... (p.25) Instantaneous velocity

$$v(a) = \lim_{\Delta t \to 0} \frac{\Delta s}{\Delta t} = \lim_{h \to 0} \frac{s(a+h) - s(a)}{h}$$

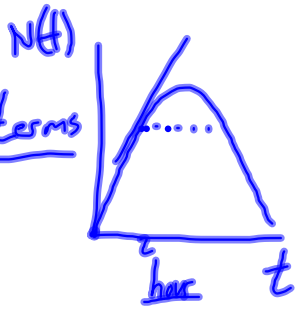


Assigned Work

p.30 # 10 - 14

Ex1: p30 #9 b

$N(t) = 20t - t^2$



$$N'(t) = \lim_{h\to 0} \frac{N(t+h) - N(t)}{h}$$

$$= \lim_{h\to 0} \frac{20(t+h) - (t+h)^2 - (20t - t^2)}{h}$$

$$= \lim_{h\to 0} \frac{20t + 20h - [t^2 + 2th + h^2] - 20t + t^2}{h}$$

$$= \lim_{h\to 0} \frac{20h - t^2 - 2th - h^2 + t^2}{h}$$

$$= \lim_{h\to 0} 20 - 2t - h$$

$$\boxed{N'(t) = 20 - 2t}$$

$N'(2) = 20 - 2(2)$

$= 16$

UPL

∴ A foreign-language student will learn 16 terms per hour at two hours of study.