# PHYS 407

5

5.1 no, pbt is not ~~P~~ linear

5.2 -10 m/s $\quad \frac{20-0}{0-2} = -10$

5.3 no

5.4 ~~$x(t) = 20 - 4.9t^2$ $x(t+\Delta t)$~~

$$v(t) = \frac{x(t+\Delta t) - 20 - 4.9t^2}{\Delta t}$$

$$v(t) = \lim_{\Delta t \to 0} \left( \frac{20 - 4.9(t+\Delta t)^2 - 20 - 4.9t^2}{\Delta t} \right)$$

$$\lim_{\Delta t \to 0} \left( \frac{20 - 4.9(t^2 + 2t\Delta t + \Delta t^2) - (20 - 4.9t^2)}{\Delta t} \right)$$

$$\lim_{\Delta t \to 0} \left( \frac{20 - 4.9t^2 - 9.8t\Delta t - 4.9\Delta t^2 - 20 + 4.9t^2}{\Delta t} \right)$$

$$\lim_{\Delta t \to 0} \left( \frac{-9.8t\Delta t - 4.9\Delta t^2}{\Delta t} \right)$$

$$\lim_{\Delta t \to 0} \left( \frac{\Delta t(-9.8t - 4.9\Delta t)}{\Delta t} \right)$$

$$\lim_{\Delta t \to 0} (-9.8t - 4.9\Delta t) = -9.8t = v(t)$$

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5.5 $x(t) = A + Bt^n$

$$v(t) = \lim_{\Delta t \to 0} \left( \frac{A + B(t+\Delta t)^n - A + Bt^n}{\Delta t} \right)$$

~~$\left( \frac{A + B(\quad)}{\Delta t} \right)$~~

$$v(t) \quad \lim_{\Delta t \to 0} \left( \frac{B(t+\Delta t)^n + Bt^n}{\Delta t} \right) \qquad \left( \frac{A + Bt^n + \Delta t - A + Bt^n}{\Delta t} \right)$$

$t^n + t^{n-1}\Delta t + \ldots + t\Delta t^{n-1} + \Delta t^n \quad \lim_{\Delta t \to 0} \left( \frac{2Bt^n + \Delta t}{\Delta t} \right)$

~~$Bt^{n+1}$~~ $\boxed{Bnt^{n-1}}$

5.6

$A = 20 \quad B = -4.9 \quad n = 2 \rightarrow -4.9 \cdot 2 \cdot t = -9.8t = v(t)$

yes

5.7 $-9.8 m/s^2$, no other forces acting upon the ball (other than gravity)

5.8 constant

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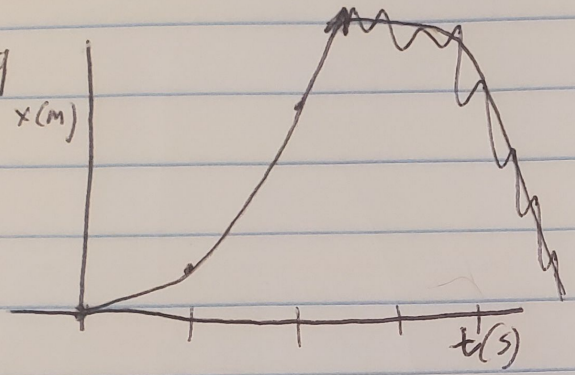
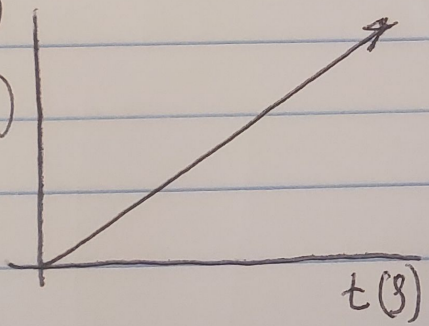
S.9




S.10




S.11