Άσκηση 1

$x(t) = A + Bt + Ct^2$ → Να βρεθούν οι μονάδες των A, B, C

Θέση (t)

L

m

A → m

B → m/sec

C → m/sec^2

$B \cdot t = L$

$\frac{m}{sec} \cdot sec = m \rightsquigarrow$ **B → $\frac{m}{sec}$**

m sec kg (SI)

L, T, M

$F = m \cdot a = kg \cdot m/s^2 \rightsquigarrow N$

β) $H = \frac{x^2 U}{F}$

$\frac{m^2 \cdot \frac{m}{sec}}{N} = \frac{m^3/sec}{kg \cdot \frac{m}{sec^2}} = \frac{m^2 \cdot sec}{kg}$

H → $\frac{m^2 \cdot sec}{kg}$

Άσκηση 2

$$x(t) = A + B \cdot t^{3/2} + C \cdot t^{4/7}$$

m m m m

m m

m

$A \rightsquigarrow m$

$B \rightsquigarrow m/sec^{3/2}$

$C \rightsquigarrow m/sec^{4/7}$

$$B \cdot t^{3/2} = L$$

$$\frac{m}{sec^{3/2}} \cdot sec^{3/2} = m$$

$A \rightsquigarrow m$

$B \rightsquigarrow m/sec^{3/2}$

$C \rightsquigarrow m/sec^{4/7} \rightarrow sec^{4/7} \rightarrow \sqrt[7]{sec^4}$

$\Lambda.\chi. \rightarrow sec^{1/2} \rightsquigarrow \sqrt[2]{sec}$

Β)

$$H = \frac{x^{7/2} \cdot a^{3/4}}{m^{1/6}} \rightsquigarrow \frac{m^{7/2} \cdot \left(\frac{m}{sec^2}\right)^{3/4} kg^{1/6} \cdot sec^{4/4}}{kg^{1/6}} \cdot \frac{m^{3/4}}{sec^{6/4}} = \frac{m^{(7/2 + 3/4)}}{kg^{1/6} \cdot sec^{6/4}} =$$

$$= \frac{m^{17/4}}{kg^{1/6} \cdot sec^{6/4}}$$

Άρα οι μονάδες του H είναι $\dfrac{m^{17/4}}{kg^{1/6} \cdot sec^{6/4}}$ ✓

Ejercicio 3

a) $U(t) = \underbrace{A}_{m/s} + \underbrace{Bt}_{m/s} + \underbrace{Ct^2}_{m/s}$ (el término Ct^2 en m/s)

$B \cdot t \rightsquigarrow m/s$

$B \cdot seg \rightsquigarrow m/s$

$B \rightsquigarrow m/s^2$

$\rightarrow$

$A \rightarrow m/s$

$B \rightarrow m/s^2$

$C \rightarrow m/s^3$

b) $H = \dfrac{t^2 \cdot x^{5/2}}{f^{1/2} \cdot m^{-1/2}}$ (masa) $\rightsquigarrow \dfrac{seg^2 \cdot m^{5/2}}{(kg \cdot m/seg^2)^{1/2} \cdot kg^{-1/2}} \rightarrow \dfrac{seg^2 \cdot m^{5/2}}{\sqrt{kg} \cdot m^{1/2}} \dfrac{1}{\sqrt{kg}} \rightarrow \dfrac{seg^2 \cdot m^{5/2}}{\frac{m^{1/2}}{seg}} \rightarrow$

$\rightarrow \dfrac{seg^3 \, m^{5/2}}{m^{1/2}} \rightsquigarrow seg^3 \cdot m^{(5/2 - 1/2)} \rightarrow \boxed{seg^3 \cdot m^2}$

'Agunon 4

B) $H = \dfrac{F^{1/2} \cdot x^2 \cdot t}{F^{-1/2} \cdot M^{-1/2}} \rightsquigarrow F^{1/2} \cdot F^{1/2} \cdot x^2 \cdot t \cdot M^{1/2} \rightsquigarrow F \cdot x^2 \cdot t \cdot \sqrt{M} \rightsquigarrow$

$\rightsquigarrow kg \cdot m/sec^2 \cdot m^2 \cdot sec \cdot kg^{1/2} \rightsquigarrow kg^1 \cdot kg^{1/2}\ m^3/sec \rightsquigarrow$ $\boxed{kg^{3/2} \cdot m^3/sec}$

'Agunon 5

$m = 2kg$

x y

$\vec{r}(t) = 3t\,\hat{i} + (2t^2+3)\,\hat{j}$

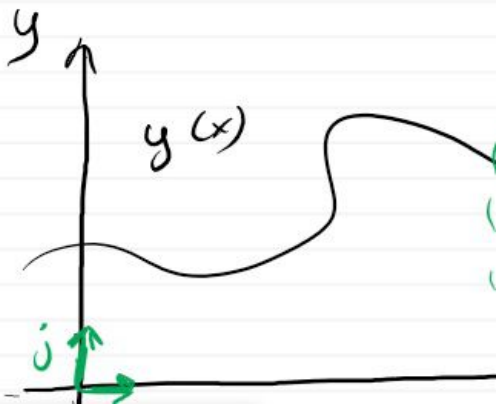
$y(x) =$;

$v(t) =$;

$a(t) =$;

$|v|$ } $t=0$ sec

θ_v } $t=2$ sec



'Agunon 5

$m = 2\,kg$

$x\ y$

$\vec{r}(t) = 3t\,\hat{i} + (2t^2+3)\,\hat{j}$

$y(x) = ;$

$v(t) = ;$

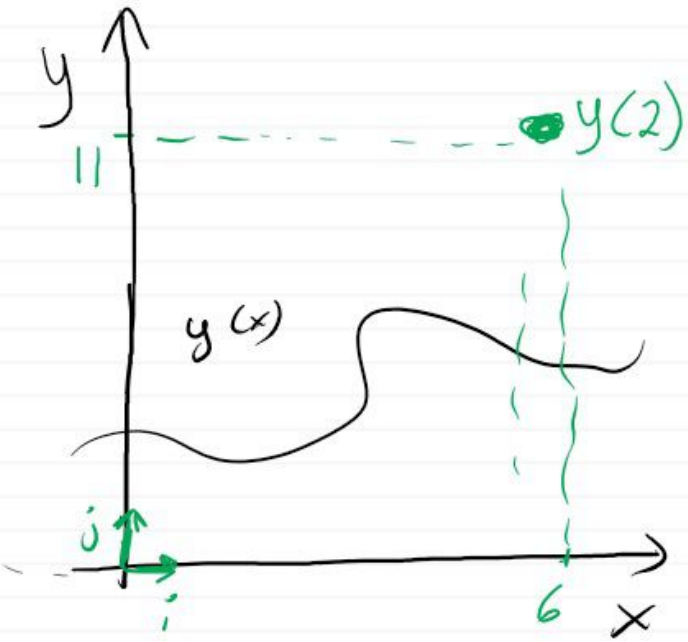
$a(t) = ;$

$|v|$ } $t = 0$ sec

θ_v } $t = 2$ sec

$F = ;$

$W_{0\to 5\,sec} = ;$



$$\begin{cases} x = 3t \\ y = 2t^2+3 \end{cases} \Rightarrow \begin{cases} t = x/3 \\ y = 2t^2+3 \end{cases} \quad y(x) = 2\cdot\left(\frac{x}{3}\right)^2 + 3 = \frac{2}{9}\cdot x^2 + 3$$

$$\boxed{y(x) = \frac{2}{9}x^2 + 3}$$

$\tan\theta = \frac{8}{3}$

$\operatorname{atan}\frac{8}{3} = \ldots\,rad$

$\rightarrow \vec{v}(t) = \frac{d\vec{r}(t)}{dt} \longrightarrow \boxed{\vec{v}(t) = 3\hat{i} + 4t\hat{j}} \rightsquigarrow |v(0)| = |3\hat{i}| = 3\ m/s$

$|v(2)| = |3\hat{i} + 8\hat{j}| = \sqrt{3^2 + 8^2} =$

$= \sqrt{9+64} = \sqrt{73}\ m/s$

$\rightarrow \vec{a}(t) = \frac{d^2 r(t)}{dt^2} = \frac{d\vec{v}(t)}{dt} \Rightarrow \boxed{\vec{a}(t) = 4\hat{j}}$

$\rightarrow \vec{F} = m \cdot \vec{a} \Rightarrow \vec{F}(t) = m \cdot 4\hat{j} \Rightarrow \boxed{\vec{F}(t) = 8\hat{j}}$

$\rightarrow W_{0-5sec} = F \cdot \Delta r_j = 8 \cdot 50 = \underline{400\,J}$ (F και Δr_j με την ίδια κατεύθυνση, $\theta = 0°$)

$\Delta r_j = r_j(5) - r_j(0) = 53 - 3 = 50\,m$

Α΄ τρόπος

Β΄ τρόπος

$\rightarrow W_{0-5sec} = \int_0^5 \vec{F}\,d\vec{r} \Rightarrow W = \int_0^5 32 \cdot t\,dt = 32\left[\frac{t^2}{2}\right]_0^5 = 32 \cdot \frac{25}{2} = 400\,J$

Αντικαθιστώ

Από $dr \rightsquigarrow dt$

$\frac{d\vec{r}}{dt} = 3\hat{i} + 4t\hat{j} \Rightarrow d\vec{r} = 3\,dt\,\hat{i} + 4\,dt \cdot t \cdot \hat{j}$

$\vec{F} = 0\hat{i} + 8\hat{j}$

$\vec{F} \cdot d\vec{r} = 0\hat{i} + 32 \cdot t\,dt \cdot \hat{j}$