EMI — ESCUELA MILITAR DE INGENIERÍA — "Mcal. Antonio José de Sucre" — Prestigio, Disciplina y Mejores Oportunidades	**PRIMER PARCIAL** **SOLUCIONARIO DEL EXAMEN (MOSOL)**	
CARRERA: CIENCIAS BASICAS	**ASIGNATURA:** FÍSICA I	**FECHA:** 26/03/2021
CURSO: PRIMER SEMESTRE	**DOCENTE:** LIC. JOSE LUIS MAMANI CERVANTES LIC. CESAR VLADIMIR ARANCIBIA CARBAJAL	
UNIDADES TEMÁTICAS A EVALUAR	1.- Movimiento rectilíneo, Mov. Acelerado, Mov. Acelerado variable 2.- Movimiento en el plano, Coordenadas Cartesianas y Normal Tangencial	

RESOLUCION DEL EXAMEN

P-1 $x = \cos 2\pi t \cdot e^{-\frac{\pi}{2}t}$

a) $$v_x = \frac{dx}{dt}$$

$$v_x = \frac{d}{dt}\left(\cos 2\pi t \cdot e^{-\frac{\pi}{2}t}\right)$$

$$v_x = e^{-\frac{\pi}{2}t}\left(-\sin 2\pi t \cdot 2\pi\right) + e^{-\frac{\pi}{2}t}\left(-\frac{\pi}{2}\right)\cos 2\pi t$$

$$v_x = -2\pi e^{-\frac{\pi}{2}t}\sin 2\pi t - \frac{\pi}{2}e^{-\frac{\pi}{2}t}\cos 2\pi t$$

$$\boxed{v_x = -\frac{\pi}{2}e^{-\frac{\pi}{2}t}\left\{4\sin 2\pi t + \cos 2\pi t\right\}}$$ Sol a)

b) $$a_x = \frac{dv_x}{dt}$$

$$a_x = \frac{d}{dt}\left(-\frac{\pi}{2}e^{-\frac{\pi}{2}t}\left\{4\sin 2\pi t + \cos 2\pi t\right\}\right)$$

$$a_x = -\frac{\pi}{2}e^{-\frac{\pi}{2}t}\left(-\frac{\pi}{2}\right)\left\{4\sin 2\pi t + \cos 2\pi t\right\} + \left(-\frac{\pi}{2}e^{-\frac{\pi}{2}t}\right)\left(4\cos 2\pi t - \sin 2\pi t\right)(2\pi)$$

$$a_x = \frac{\pi^2}{4}e^{-\frac{\pi}{2}t}\left(4\sin 2\pi t + \cos 2\pi t\right) - \pi^2 e^{-\frac{\pi}{2}t}\left(4\cos 2\pi t - \sin 2\pi t\right)$$

$$a_x = \pi^2 e^{-\frac{\pi}{2}t} \left\{ \sin 2\pi t + \frac{\cos 2\pi t}{4} - 4\cos 2\pi t + \sin 2\pi t \right\}$$

$$\boxed{a_x = \pi^2 e^{-\frac{\pi}{2}t} \left(2\sin 2\pi t - \frac{15}{4}\cos 2\pi t \right)}$$ Sol 6)

P-2 $v(t) = \left(\frac{3}{2}t^2 + 4\right) [m/s]$

Datos Iniciales

$x_0 = -1\ m$

$t_0 = 0\ s$

$a = 6\ m/s^2$

$$v_x = \frac{dx}{dt} \Rightarrow \int_{x_0=1}^{x} dx = \int_{t_0=0}^{t} v(t)\, dt$$

$$\hookrightarrow x\Big|_{-1}^{x} = \int_0^t \left(\frac{3}{2}t^2 + 4\right) dt$$

$$\Rightarrow x + 1 = \frac{3}{2}\int_0^t t^2\, dt + 4\int_0^t dt$$

$$x + 1 = \frac{3}{2}\left(\frac{t^3}{3}\Big|_0^t\right) + 4\, t\Big|_0^t$$

$$x + 1 = \frac{t^3}{2} + 4t$$

$$x = \frac{t^3}{2} + 4t - 1$$

Sabemos

$$a = \frac{dv}{dt} \Rightarrow a = \frac{d}{dt}\left(\frac{3}{2}t^2 + 4\right) = \frac{3}{2}(2t) = 3t$$

$$a = 3t$$

si $a = 6\ m/s^2$

$\hookrightarrow\ 6 = 3t \Rightarrow \underline{t = 2s}$

Entonces

si $t = 2s$

$X = \frac{(2)^3}{2} + 4(2) - 1$

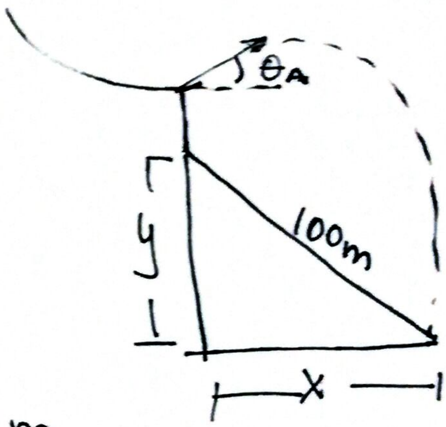
$X = 4 + 8 - 1$

$\therefore \boxed{X = 11\ m}$ sol.

P-3

$\sin\alpha = \frac{3}{5}$

$\cos\alpha = \frac{4}{5}$



Sabemos

$X = 100\cos\alpha = 100\left(\frac{4}{5}\right) = 80\,m$

$y = 100\sin\alpha = 100\left(\frac{3}{5}\right) = 60\,m$

Eje "X"

$X = X_0 + v_x t$

$80 = v_x t \Rightarrow t = \frac{80}{v_x}$

$t = \frac{80}{v_0 \cos 25}$

Eje "y" $\quad y = y_0 + v_{0y} t - \frac{1}{2} g t^2$

$$-64 = 0 + v_0 \sin 25\, t - \frac{1}{2}(9{,}8) t^2$$

$$-64 = v_0 \sin 25 \left(\frac{80}{v_0 \cos 25}\right) - \frac{9{,}8}{2}\left(\frac{80}{v_0 \cos 25}\right)^2$$

$$-64 = 37{,}3 - \frac{38217{,}96}{v_0^2}$$

$$v_0 = \sqrt{\frac{38217{,}96}{101{,}3}} \Rightarrow \boxed{v_0 = 19{,}4 \ m/s}$$ **sol a)**

b) $t = \dfrac{80}{v_0 \cos 25} = \dfrac{80}{19{,}4 \cos 25} \Rightarrow \boxed{t = 4{,}55 \ s}$ **sol b)**

cos

P-4

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

$$v = \frac{dr}{dt} = \frac{d}{dt}\left(t^3 \hat{i} + t^2 \hat{j}\right) \Rightarrow \vec{v} = 3t^2 \hat{i} + 2t \hat{j}$$

si $t = 2s \Rightarrow \vec{v} = 3(2)^2 \hat{i} + 2(2) \hat{j} \Rightarrow \vec{v} = 12 \hat{i} + 4 \hat{j}$

$$|\vec{v}| = v^2 = 160 \ m^2/s^2$$

$$a = \frac{dv}{dt} = \frac{d}{dt}\left(3t^2 \hat{i} + 2t \hat{j}\right) = 6t \hat{i} + 2 \hat{j}$$

si $t = 2s \Rightarrow a = 6(2) \hat{i} + 2 \hat{j} = 12 \hat{i} + 2 \hat{j}$

$\boxed{a = 12{,}17 \ m/s} \Rightarrow$ aceleración total

Sabemos $\quad \rho = \dfrac{\left(1 + \left(\frac{dy}{dx}\right)^2\right)^{3/2}}{\left|\frac{d^2 y}{dx^2}\right|}$

si $y = f(x)$ si: $\vec{r} = t^3\hat{i} + t^2\hat{j}$

$\Rightarrow x = t^3$ y $y = t^2$

$t = x^{1/3} \Rightarrow \underline{y = x^{2/3}}$

Derivamos

si $t = 2s$

$x = (2)^3 = 8m$

$$\frac{dy}{dx} = \frac{d}{dx}\left(x^{2/3}\right) = \frac{2}{3}x^{-\frac{1}{3}}$$

$$\frac{dy}{dx} = \frac{2}{3}(8)^{-1/3} = \frac{1}{3}$$

$$\frac{d^2y}{dx^2} = \frac{d}{dx}\left(\frac{dy}{dx}\right) = \frac{2}{3}\left(-\frac{1}{3}\right)x^{-\frac{4}{3}} = -\frac{2}{9}x^{-4/3}$$

$$\frac{d^2y}{dx^2} = -\frac{2}{9}(8)^{-4/3} \Rightarrow \left|\frac{d^2y}{dx^2}\right| = \left|-\frac{1}{72}\right| = \frac{1}{72}$$

$$\Rightarrow \rho = \frac{\left(1 + \left(\frac{1}{3}\right)^2\right)^{3/2}}{1/72} \Rightarrow \boxed{\rho = 84{,}33\ m}$$

$$a_N = \frac{v^2}{\rho} = \frac{160}{84{,}33} \Rightarrow \boxed{a_N = 1{,}9\ m/s^2}$$ $\Rightarrow$ aceleración Normal

$$a^2 = a_T^2 + a_N^2 \Rightarrow a_T = \sqrt{a^2 - a_N^2}$$

$$a_T = \sqrt{12{,}17^2 - 1{,}9^2} =$$

$$\boxed{a_T = 12{,}02\ m/s^2}$$ $\Rightarrow$ aceleración tangencial