HOJA 1.1 – CINEMÁTICA

① a) $\vec{r}(0) = (2\cdot 0^2+4)\vec{i} + 5\cdot 0\vec{j} \rightarrow \boxed{\vec{r}(0) = 4\vec{i}\ m}$

$\vec{r}(2) = (2\cdot 2^2+4)\vec{i} + 5\cdot 2\vec{j} \rightarrow \boxed{\vec{r}(2) = 12\vec{i} + 10\vec{j}}$

b) $\vec{v}_m = \dfrac{\vec{r}-\vec{r}_0}{t-t_0} \rightarrow \vec{v}_m = \dfrac{12\vec{i}+10\vec{j}-4\vec{i}}{2-0} = \boxed{(4\vec{i}+5\vec{j})\ m/s}$

c) $\vec{v} = \dfrac{d\vec{r}}{dt} = 4t\vec{i} + 5\vec{j} \rightarrow \boxed{\vec{v}(2) = (8\vec{i}+5\vec{j})\ m/s}$

$\|\vec{v}\| = \sqrt{8^2+5^2} = \sqrt{89} = \boxed{9'43\ m/s}$

②

	Tiempo	V. Posición (m)
A	2s.	$\vec{r}_1 = 8\vec{i}$
B	12 s.	$\vec{r}_2 = 40\vec{i}$
C	28 s.	$\vec{r}_3 = 80\vec{i}$

$v_m(AB) = \dfrac{\Delta r}{\Delta t} = \dfrac{40-8}{12-2} = \dfrac{32}{10} = 3'2\ m/s \rightarrow \boxed{11'52\ Km/h}$

$v_m(BC) = \dfrac{\Delta r}{\Delta t} = \dfrac{80-40}{28-12} = \dfrac{40}{16} = 2'5\ m/s \rightarrow \boxed{9\ Km/h}$

$v_m(AC) = \dfrac{\Delta r}{\Delta t} = \dfrac{80-8}{28-2} = \dfrac{72}{26} = 2'77\ m/s \rightarrow \boxed{9'97\ Km/h}$

③ a) $\vec{r}(1) = (1+4)\vec{i} + (2\cdot 1-2)\vec{j} \rightarrow \boxed{\vec{r}(1) = 5\vec{i}\ m}$

$\vec{r}(3) = (3+4)\vec{i} + (2\cdot 3-2)\vec{j} \rightarrow \boxed{\vec{r}(3) = (7\vec{i}+4\vec{j})\ m}$

b) $\Delta\vec{r} = 7\vec{i}+4\vec{j} - 5\vec{i} = \boxed{(2\vec{i}+4\vec{j})\ m}$

c) $\vec{v}_m = \dfrac{\Delta r}{\Delta t} = \dfrac{2\vec{i}+4\vec{j}}{3-1} = \boxed{(\vec{i}+2\vec{j})\ m/s}$ $\quad \|\vec{v}_m\| = \sqrt{1^2+2^2} = \sqrt{5} = \boxed{2'24\ m/s}$

d) $\vec{v} = \dfrac{d\vec{r}}{dt} = \boxed{(\vec{i}+2\vec{j})\ m/s}$ $\quad \|\vec{v}\| = \sqrt{1^2+2^2} = \sqrt{5} = \boxed{2'24\ m/s}$

e) $\left.\begin{array}{l} x(t) = t+4 \\ y(t) = 2t-2 \end{array}\right\} \rightarrow t = x-4$

$y = 2(x-4) - 2 = 2x - 8 - 2 = \boxed{2x-10}$

④ a) $\left.\begin{array}{l} x(t) = 4 \\ y(t) = t \end{array}\right\} \boxed{x = 4}$

b) $\vec{r}(1) = \boxed{(4\vec{i}+\vec{j})\ m}$

$\vec{r}(3) = \boxed{(4\vec{i}+3\vec{j})\ m}$

c) $\Delta\vec{r} = \vec{r}(3) - \vec{r}(1) = 4\vec{i}+3\vec{j} - 4\vec{i} - \vec{j} = \boxed{2\vec{j}\ m} \rightarrow |\Delta\vec{r}| = \sqrt{2^2} = \boxed{2\ m}$

d) $\vec{r}(5) = \boxed{(4\vec{i}+5\vec{j})\ m}$

$\Delta\vec{r} = \vec{r}(5) - \vec{r}(3) = 4\vec{i}+5\vec{j} - 4\vec{i} - 3\vec{j} = \boxed{2\vec{j}\ m} \rightarrow |\Delta\vec{r}| = \sqrt{2^2} = \boxed{2\ m}$

⑤ a) $\left.\begin{array}{l} x(t) = 4t \\ y(t) = t^2+1 \end{array}\right\} \rightarrow t = x/4$

$\rightarrow \boxed{y = \dfrac{x^2}{16} + 1}$ $\quad \vec{r}(2) = 4\cdot 2\vec{i} + 4^2 + 1\vec{j} = \boxed{(8\vec{i}+17\vec{j})\ m}$

b) $\vec{v} = \dfrac{d\vec{r}}{dt} = 4\vec{i} + 2t\vec{j} \rightarrow \vec{v}(2) = (4\vec{i}+2\cdot 2\vec{j}) = \boxed{(4\vec{i}+4\vec{j})\ m/s}$

$\|\vec{v}\| = \sqrt{4^2+4^2} = \sqrt{32} = \boxed{5'66\ m/s}$

c) $\vec{a} = \dfrac{d\vec{v}}{dt} = \boxed{2\vec{j}\ m/s^2}$ $\quad \|\vec{a}\| = \sqrt{2^2} = \boxed{2\ m/s^2}$

⑥ a) $a_n = \frac{v^2}{R} = \frac{(5+4\cdot 2)^2}{12} = \boxed{14'083\ m/s^2}$

$a_t = \frac{dv}{dt} = \boxed{4\ m/s^2}$

b) $|\vec{a}| = \sqrt{a_t^2 + a_n^2} = \sqrt{4^2 + 14'083^2} = \boxed{14'64\ m/s^2}$

⑦ a) El coche está sometido a la aceleración normal.

b) $a_n = \frac{v^2}{R} \rightarrow R = \frac{v^2}{a_n} = \frac{20^2}{5} = \boxed{80\ m}$

⑧ $\vec{r}(2) = (5-2)\vec{i} + 2\cdot 2\vec{j} = 3\vec{i} + 4\vec{j}$

$\vec{r}(3) = (5-3)\vec{i} + 2\cdot 3\vec{j} = 2\vec{i} + 6\vec{j}$

$\Delta\vec{r} = \vec{r}(3) - \vec{r}(2) = 2\vec{i} + 6\vec{j} - 3\vec{i} - 4\vec{j} = \boxed{(-\vec{i} + 2\vec{j})\ m}$

⑨ a) $\vec{v} = \frac{d\vec{r}}{dt} = \boxed{(4\vec{i} + 3t\vec{j})\ m/s}$

$\|\vec{v}\| = \sqrt{4^2 + 3^2t^2} = \boxed{\sqrt{16+9t^2}\ m/s}$

b) $\vec{a} = \frac{d\vec{v}}{dt} = \boxed{3\vec{j}\ m/s^2}$

$\|\vec{a}\| = \sqrt{3^2} = \boxed{3\ m/s^2}$