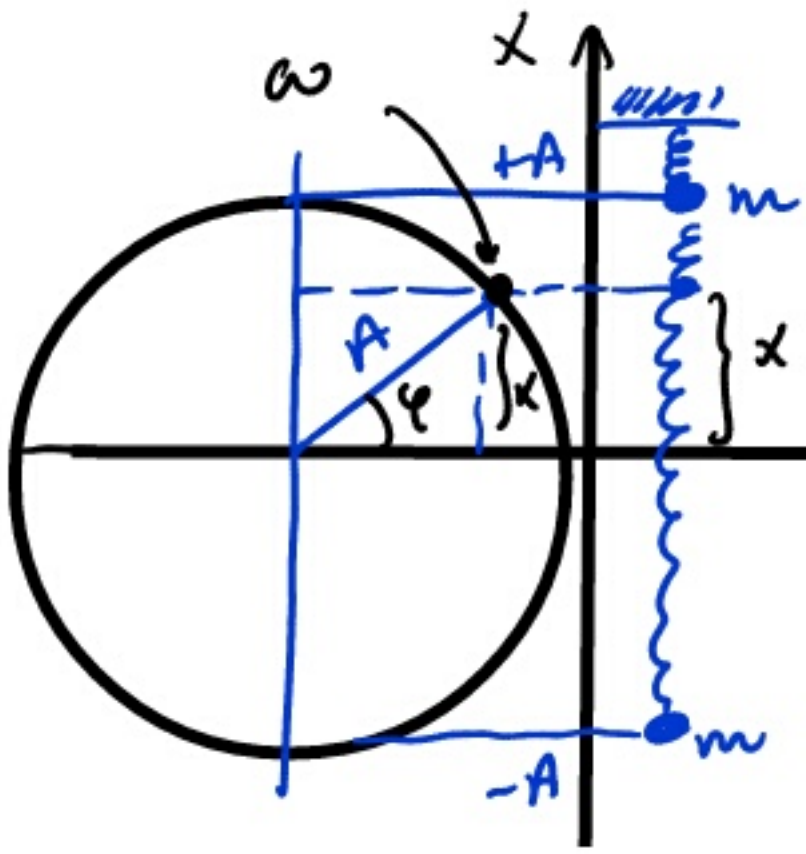
M.A.S



x ≡ elongación

φ ≡ FASE

ω ≡ pulsación

$\omega = \frac{\varphi}{t} \rightarrow \varphi = \omega t$

t

$x = A \operatorname{sen} \varphi$

$x = A \operatorname{sen} \omega t$

$\varphi_0 = 0 \rightarrow x = A \operatorname{sen} \omega t$

$\varphi \neq 0 \rightarrow x = A \operatorname{sen}(\omega t + \varphi_0)$

$$\boxed{x = A \operatorname{sen}(\omega t + \varphi_0)}$$

$\omega = \frac{2\pi}{T} = 2\pi\nu$

$$\boxed{x = A \operatorname{sen}(2\pi\nu t + \varphi_0)}$$

$-1 \leq \operatorname{sen} \varphi \leq 1$

$$\boxed{x = \pm A}$$

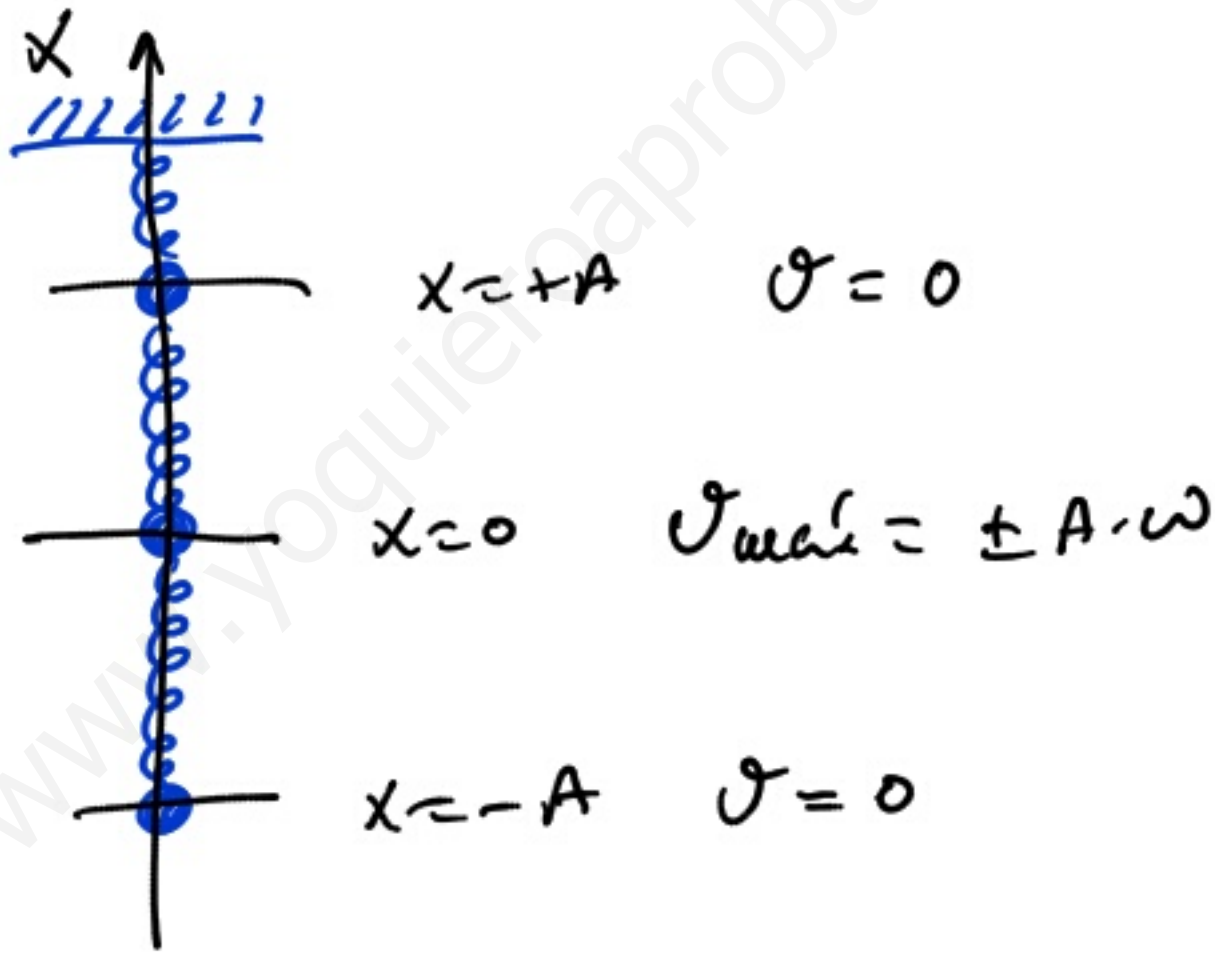
VELOCIDAD

$$x = A \operatorname{sen}(\omega t + \varphi_0)$$

$$v = \frac{dx}{dt} = A \cdot \omega \cos(\omega t + \varphi_0)$$

$$-1 \leq \cos(\omega t + \varphi_0) \leq 1$$

$$v_{max} = \pm A \cdot \omega \quad ; \quad |v_{max}| = A \cdot \omega$$



$$x = A \operatorname{sen}(\omega t + \varphi_0) \rightarrow \operatorname{sen}(\omega t + \varphi_0) = \frac{x}{A}$$

$$v = \frac{dx}{dt} = A \cdot \omega \cos(\omega t + \varphi_0) \rightarrow \cos(\omega t + \varphi_0) = \frac{v}{A \cdot \omega}$$

$$\varphi = \omega t + \varphi_0$$

FASE ← φ → FASE INICIAL

$$\left.\begin{aligned} \operatorname{sen}\varphi &= \frac{x}{A} \\ \cos\varphi &= \frac{v}{A \cdot \omega} \end{aligned}\right\} \quad \operatorname{sen}^2\varphi + \cos^2\varphi = 1$$

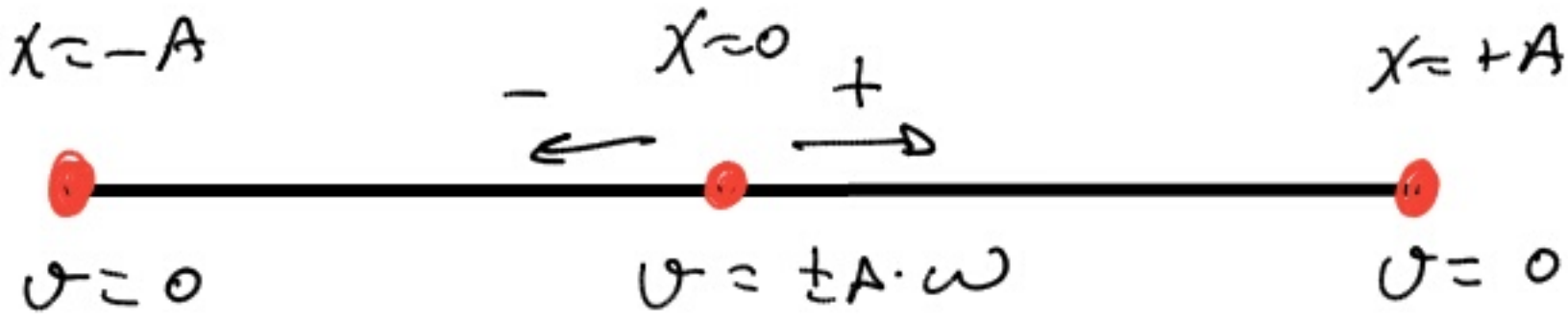
$$\frac{x^2}{A^2} + \frac{v^2}{A^2\omega^2} = 1$$

$$\frac{v^2}{A^2 \cdot \omega^2} = 1 - \frac{x^2}{A^2} \rightarrow v^2 = A^2 \cdot \omega^2 \left(1 - \frac{x^2}{A^2}\right) =$$

$$= A^2 \cdot \omega^2 - \cancel{A^2} \cdot \omega^2 \cdot \frac{x^2}{\cancel{A^2}} = \omega^2 (A^2 - x^2)$$

$$v^2 = \omega^2 (A^2 - x^2)$$

$$\boxed{v = \pm \omega \sqrt{A^2 - x^2}}$$

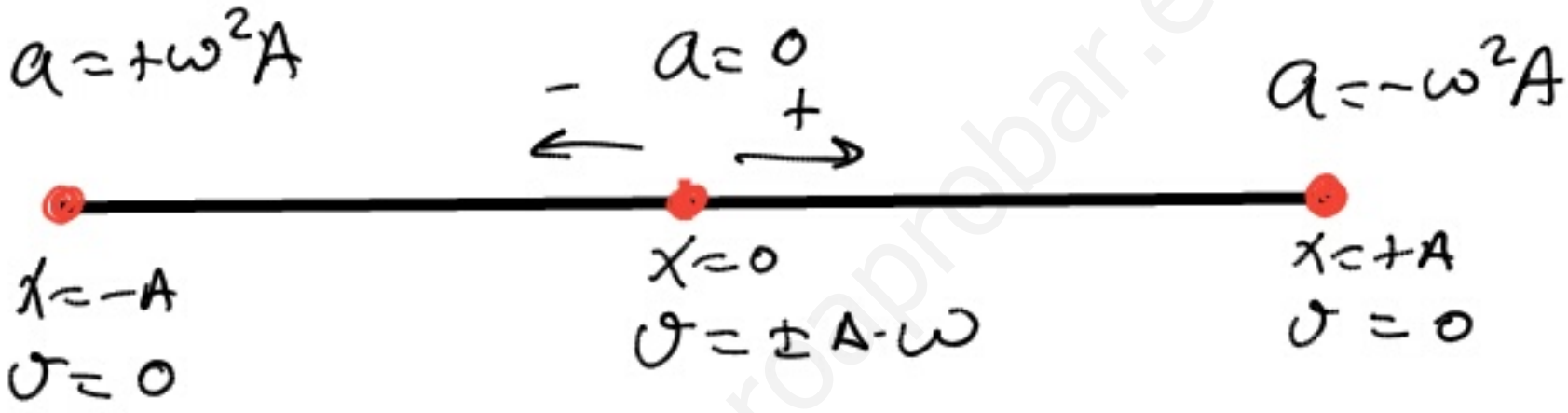


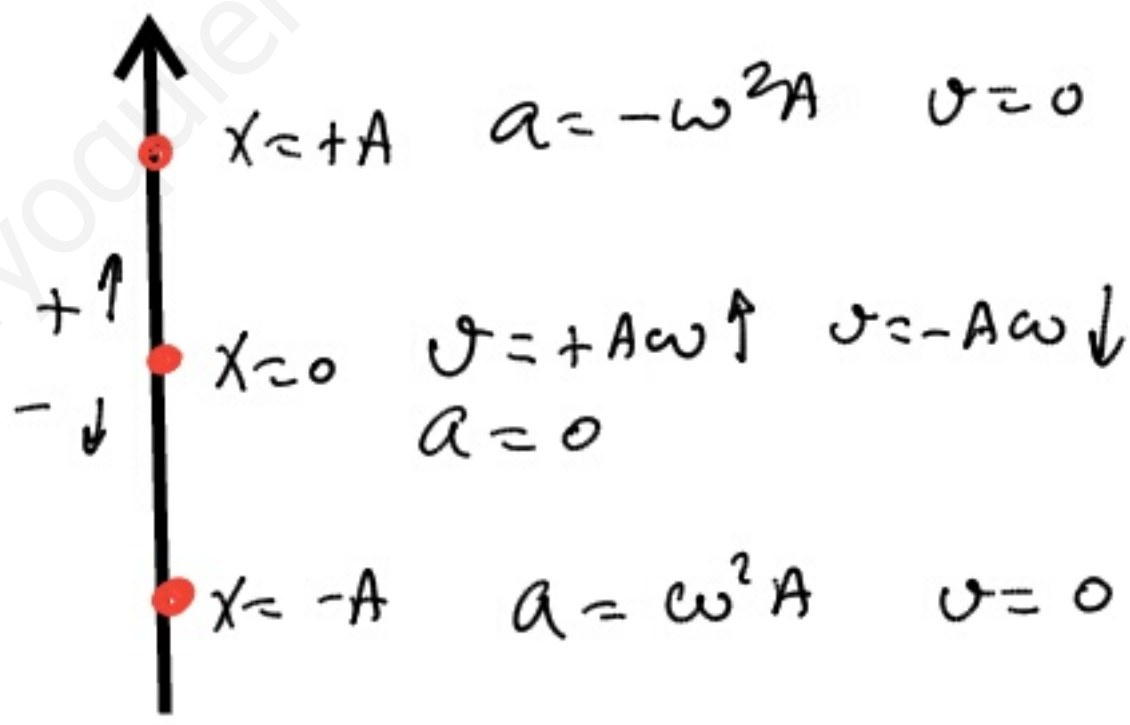
ACELERACIÓN

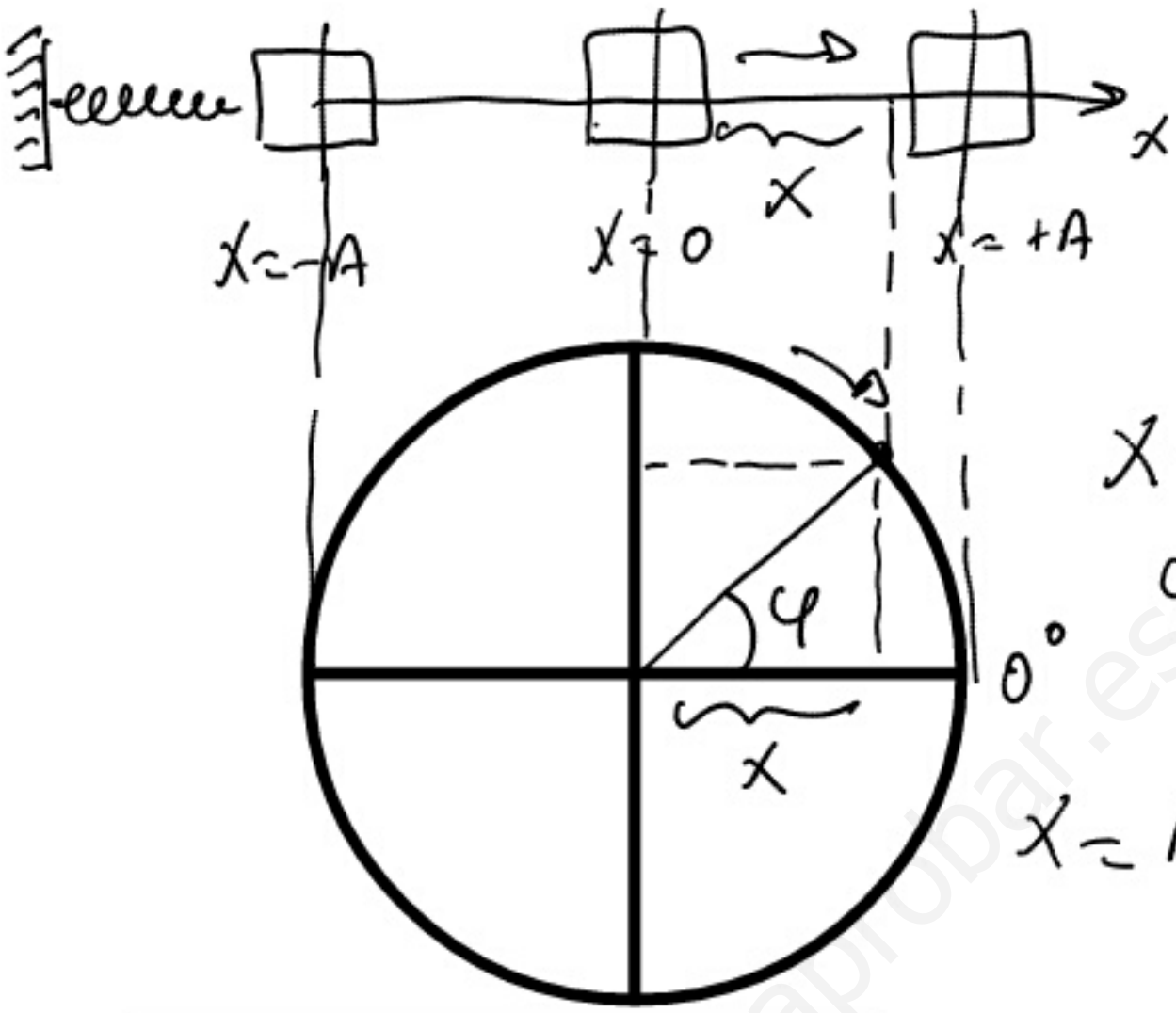
$$x = A \operatorname{sen}(\omega t + \varphi_0)$$

$$v = \frac{dx}{dt} = A \cdot \omega \cos(\omega t + \varphi_0) \quad ; \quad v = \pm \omega \sqrt{A^2 - x^2}$$

$$a = \frac{dv}{dt} = -A \cdot \omega^2 \operatorname{sen}(\omega t + \varphi_0) = -\omega^2 x$$





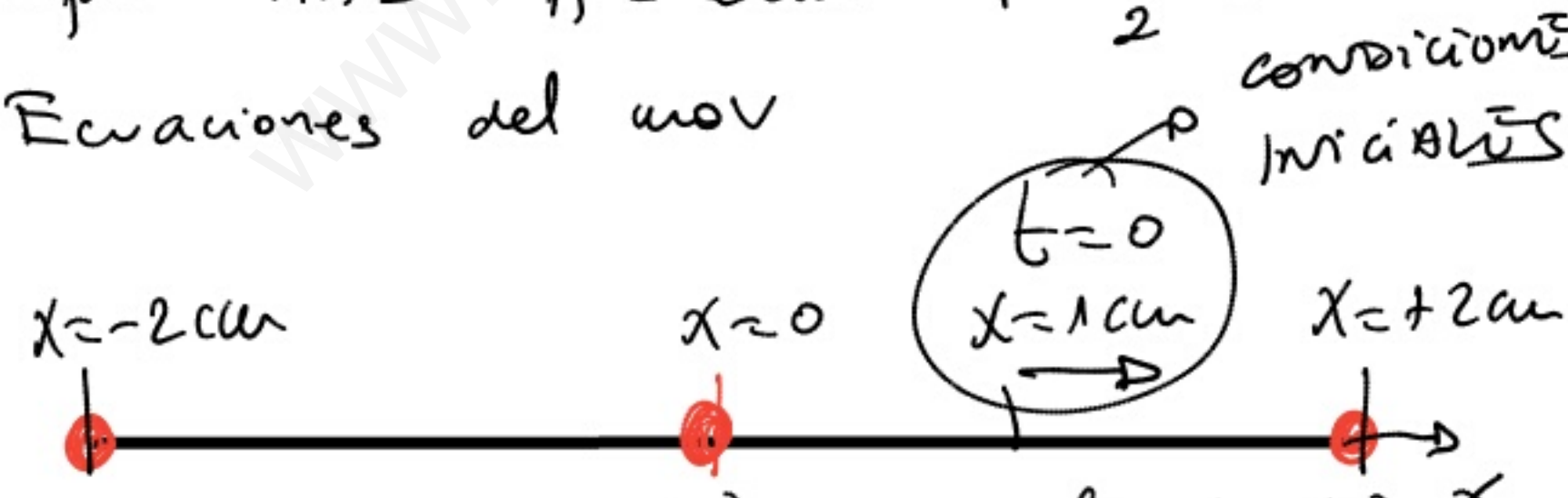


$$\boxed{X = A\cos(\omega t + \varphi_0)}$$

$$\text{sen}\,\varphi = \cos\left(\varphi + \pi/2\right)$$

Ejemplo MA-S $A = 2\,cm$ $T = \frac{1}{2}\,s$

Ecuaciones del mov



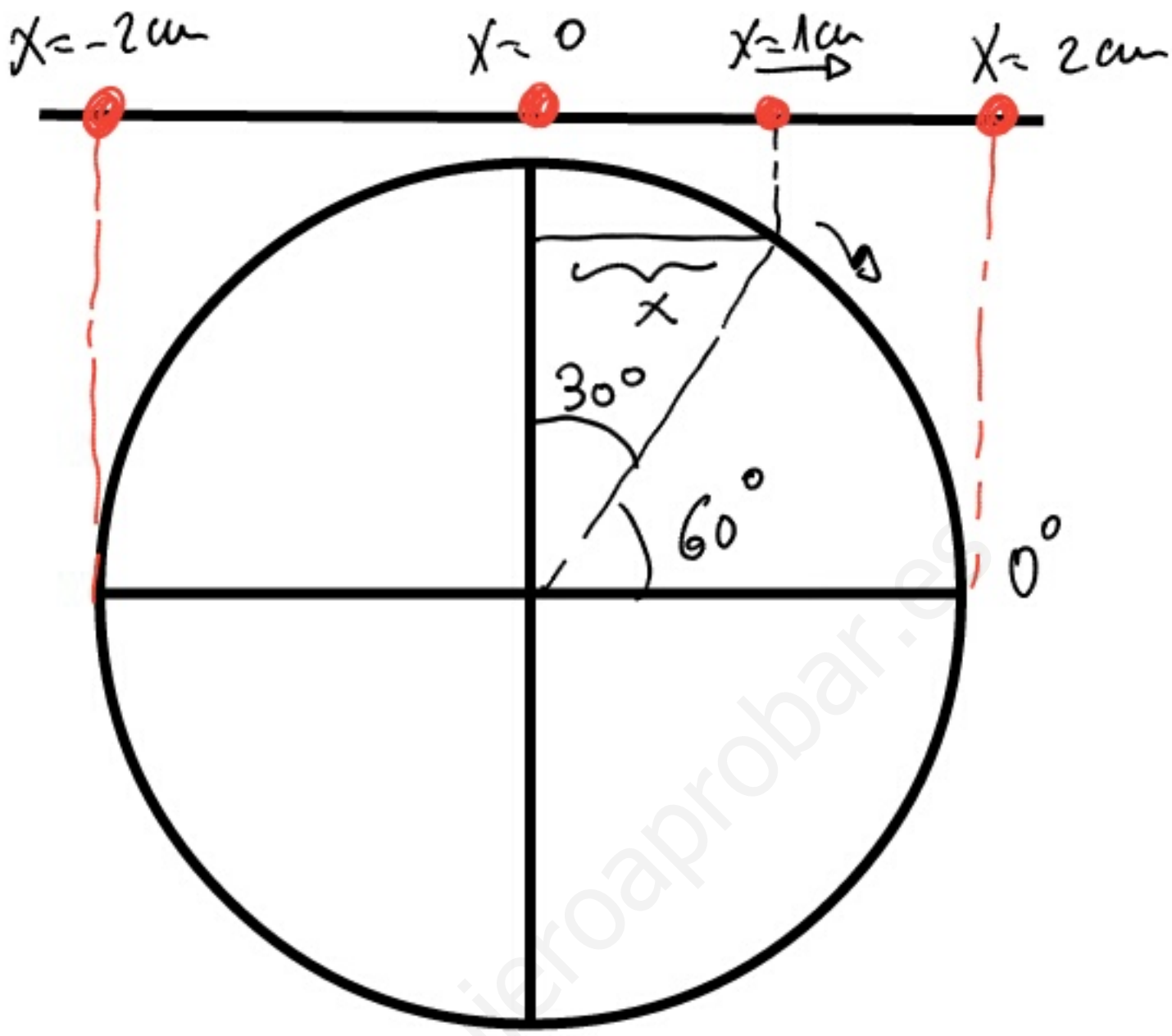
$$X = A\cos(\omega t + \varphi_0) = 2\cos(4\pi t + \varphi_0)$$

$$\omega = \frac{2\pi}{T} = \frac{2\pi}{1/2} = 4\pi\ rad/s$$

$t = 0,\ X = 1\,cm$

$$1 = 2\cos\varphi_0 \rightarrow \cos\varphi_0 = \frac{1}{2}$$

$$\varphi_0 = 60° = \pi/3$$



$$x = 2 \cos(4\pi t + \pi/3)$$

$A = 2\ cm \quad T = 1/2\ s$

$t = 0\ ;\ x = 1\ cm$

Condiciones iniciales

$x = A\ sen(\omega t + \varphi_0)\ ;\ \omega = \frac{2\pi}{T} = \frac{2\pi}{1/2} = 4\pi\ rad/s$

$x = 2\ sen(4\pi t + \varphi_0)\ ;\ 1 = 2\ sen\varphi_0\ ;\ sen\varphi_0 = 1/2$

$\varphi_0 = 30°$

$$x = 2\ sen(4\pi t + \pi/6)$$