

Answer: $\lambda = 20 \text{ m}$

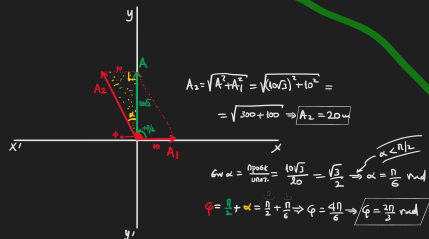
$$x = 10\sqrt{3} \cdot \left(2\pi t + \frac{\pi}{2}\right)$$

$$x_1 = 10 \cdot 2\pi t$$

$$x_2 = A_2 \cdot (2\pi t + \phi)$$

$$A_2 = ?$$

$$\phi = ?$$



Answer: $x_1 = 3 + \cos t$
 $x_2 = 4 \cdot \sin 10t$
 $x = x_1 + x_2 = ?$

$$x_1 = 3 + \cos t \Rightarrow A_1 = 3 \text{ m}$$

$$x_1 = A_1 \cdot \cos t \Rightarrow \omega = 10 \text{ rad/s}$$

$$x_2 = 4 \cdot \sin 10t = 4 \cdot \left(\cos t + \frac{\pi}{2}\right) \Rightarrow A_2 = 4 \text{ m}$$

$$x_2 = A_2 \cdot (\omega t + \phi) \Rightarrow \phi = \frac{\pi}{2} \text{ rad}$$

$$A = \sqrt{A_1^2 + A_2^2 + 2A_1A_2\cos\phi} = \sqrt{3^2 + 4^2 + 2 \cdot 3 \cdot 4 \cdot \cos\frac{\pi}{2}} = 5 \text{ m}$$

$$\phi = \frac{A_2 + \phi}{A_1 + A_2 \cos\phi} = \frac{4 + 0}{3 + 4 \cdot 0} = \frac{4}{3}$$

$$x = A \cdot (\omega t + \theta)$$

$$x = 5 \cdot (\cos t + \theta), \text{ where } \theta = \frac{4}{3}$$

~~$t=0: x = 5 \cdot (\cos 0 + \theta) = 5 + \theta = 5 + \frac{4}{3} = \frac{19}{3}$~~

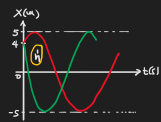
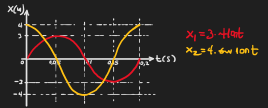
$x = x_1 + x_2 \Rightarrow x(0) = x_1(0) + x_2(0)$

- $x_1 = 3 + \cos 0 \Rightarrow x_1(0) = 3 + 1 = 4$
- $x_2 = 4 \cdot \sin 0 \Rightarrow x_2(0) = 4 \cdot 0 = 0$

$x(0) = 4 + 0 = 4 \text{ m}$

$\Delta x = 4 - 19/3 = -7/3 \text{ m}$
 just after $t=0$ $A=5 \text{ m}$

$$T = \frac{2\pi}{\omega} = \frac{2\pi}{10} = 0.2 \text{ s}$$



$x = x_1 + x_2 \Rightarrow \frac{dx}{dt} = \frac{dx_1}{dt} + \frac{dx_2}{dt} \Rightarrow v = v_1 + v_2 \xrightarrow{t=0} v(0) = v_1(0) + v_2(0)$

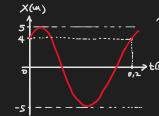
$v_1 = \omega A_1 \sin \omega t = 10 \cdot 3 \cdot \sin 10t = 30 \sin 10t \xrightarrow{t=0} 30 \cdot 0 = 0 \text{ m/s}$

$v_2 = \omega A_2 \sin(\omega t + \phi) = 10 \cdot 4 \cdot \sin(10t + \pi/2) = 40 \sin(10t + \pi/2) \xrightarrow{t=0} 40 \cdot 1 = 40 \text{ m/s}$

$v(0) = 30 \sin 0 + 40 \sin \frac{\pi}{2} = 40 \text{ m/s}$

if $v(0) > 0$, then x increases.

if $v(0) < 0$, then x decreases.



$x = 5 \cdot (\cos t + \frac{4}{3})$
 where $\phi = \frac{4}{3}$

if: $x(0) = 4 \text{ m}$
 $v(0) > 0$
 $T = 0.2 \text{ s}$
 $A = 5 \text{ m}$