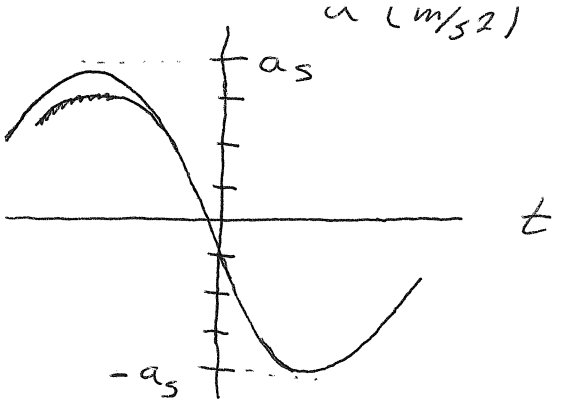
64



$a_s = 400\ m/s^2$

A wave of the form $y(x,t) = y_m \sin(kx - \omega t + \phi)$ passes through a material producing a transverse acceleration at $x = 0$ as shown above.

(1) Determine ϕ

$$y(t) = y_m \sin(-\omega t + \phi)$$

$$v(t) = -\omega y_m \cos(-\omega t + \phi)$$

$$a(t) = \underbrace{-\omega^2 y_m}_{\text{Amplitude}} \sin(-\omega t + \phi)$$

} we are finding these for a fixed position x ($x = 0$) so kx dissapears

amplitude from graph $400\ m/s^2$

$$a(0_s) = -400\,m/s^2 \sin\left(\cancel{-\omega t}^{\,0} + \phi\right) = -100\,m/s^2$$

$$\sin^{-1}\left(\frac{100}{400}\right) = \phi$$

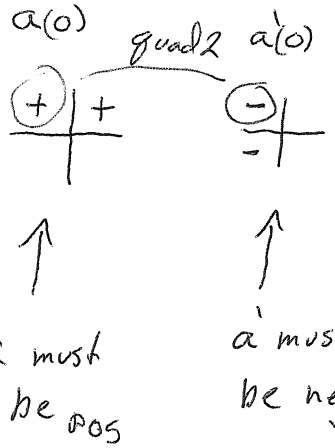
$$\phi = 0.253\ rad \quad (quad\ 1)$$
$$or$$
$$2.89\ rad \quad (quad\ 2)$$

$$\frac{d\left(a(0_s)\right)}{dt} = \omega^3 \cos\left(\cancel{-\omega t}^{\,0} + \phi\right)$$

$$\omega^3 \cos(\phi) < 0$$

↖ slope at $t=0$ of $a(t)$ is negative

Cosine is negative quad 2 and quad 3



$$\boxed{\phi = 2.89\,rad}$$