

# Wave Speed vs Transverse Velocity of a particle ①

Wave speed of  $y(x,t) = y_m \sin(kx - \omega t + \phi)$

$$v_{\text{wave}} = \lambda f = \frac{\lambda}{T} = \frac{\omega}{k}$$

Transverse Velocity of a Particle of  $y(x,t) = y_m \sin(kx - \omega t + \phi)$

$$\frac{\partial y(x,t)}{\partial t} = -\omega y_m \cos(kx - \omega t + \phi)$$

↑  
Partial derivative of  $y$  with respect to  $t$

Transverse Acceleration

$$\frac{\partial^2 y(x,t)}{\partial t^2} = -\omega^2 y_m \sin(kx - \omega t + \phi)$$

\* Wavespeed depends on \*  
properties of the medium

\* Transverse particle velocity depends \*  
on properties of the wave

- frequency
- amplitude