A traveling simple-harmonic-wave train is described by

\[ y = A \sin( k x + \omega t ) , \]

where the wave number \( k = \frac{2 \pi}{\lambda} \), and the angular frequency \( \omega = 2 \pi f \).

The traveling wave velocity \( v_{\text{wave}} \) is

A) \( v_{\text{wave}} = \lambda f \),

B) \( v_{\text{wave}} = -\lambda f \),

C) \( v_{\text{wave}} = \frac{\lambda}{f} \),

D) \( v_{\text{wave}} = -\frac{\lambda}{f} \).
Let the phase

\[ kx + \omega t = \text{constant}, \quad \text{then} \quad \frac{d(kx + \omega t)}{dt} = 0, \]

\[ v_{\text{wave}} = \frac{dx}{dt} = -\frac{\omega}{k} = -\frac{2\pi f}{2\pi} = -\frac{\lambda f}{\lambda}. \]

Answer B.

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