$$\Rightarrow \quad c^2 \frac{\partial^2 y}{\partial x^2} - \frac{\partial^2 y}{\partial t^2} = 0 \qquad (5f.2)$$

with $\sqrt{\frac{\tau}{\mu}} = c = \frac{\omega}{k}$

That is, we recovered the result from class.

We can also verify (5f.1) explicitly by substituting the solution and then taking the limit $dx \to 0$. Using (5e) we find:

$$-2\frac{\omega^2}{k} A \sin\left(kx + \frac{k\,dx}{2}\right) \sin\left(\frac{k\,dx}{2}\right) \cos(\omega t)$$

$$= (dx)\left(-\omega^2 A \sin(kx)\cos(\omega t)\right) \Big| \times \frac{1}{dx}$$

$\Rightarrow$

$$-\omega^2 A \lim_{dx \to 0} \left[\underbrace{\frac{\sin\left(k\frac{dx}{2}\right)}{k\frac{dx}{2}}}_{\to 1} \times \sin\left(kx + \underbrace{\frac{k\,dx}{2}}_{\to 0}\right) \right] \cos(\omega t)$$

$$= -\omega^2 A \sin(kx)\cos(\omega t)$$

$$\Rightarrow \underline{-\omega^2 A \sin(kx)\cos(\omega t) = -\omega^2 A \sin(kx)\cos(\omega t)}\ ✓ \qquad (5f.3)$$

Verifying $F_{net,y} = m_{ch}\, a_{ch,y}$ is the same as confirming that (5) is a SOLUTION to the W.Eq.