5. We substitute $\omega = kv$ into $y = y_m \sin(kx - \omega t)$ to obtain

$$y = y_m \sin(kx - kvt) = y_m \sin k(x - vt) \ .$$

We put $k = 2\pi/\lambda$ and $\omega = 2\pi f$ into $y = y_m \sin(kx - \omega t)$ and obtain

$$y = y_m \sin\left(\frac{2\pi x}{\lambda} - 2\pi f t\right) = y_m \sin 2\pi \left(\frac{x}{\lambda} - ft\right) \ .$$

When we substitute $k = \omega/v$ into $y = y_m \sin(kx - \omega t)$, we find

$$y = y_m \sin\left(\frac{\omega x}{v} - \omega t\right) = y_m \sin\omega \left(\frac{x}{v} - t\right) \ .$$

Finally, we substitute $k = 2\pi/\lambda$ and $\omega = 2\pi/T$ into $y = y_m \sin(kx - \omega t)$ to get

$$y = y_m \sin\left(\frac{2\pi x}{\lambda} - \frac{2\pi t}{T}\right) = y_m \sin 2\pi \left(\frac{x}{\lambda} - \frac{t}{T}\right) \ .$$