Solution to HW 6

1. First find the amplitude of $Y_m$. Total oscillation distance is 4.0 mm, (from lowest point to highest), so $Y_m = \frac{4.00}{2} = 2.00$ mm.

2. Find the angular wave number $k$: $k = \frac{2\pi}{\lambda}$ so we should determine $\lambda$ from the figure. The grid lines are 1.00 cm apart, four grid lines span one complete wave, so $\lambda = 4 \times 1.0 = 4.0$ cm.

   $k = \frac{2\pi}{\lambda} = \frac{2\pi}{0.04} = \frac{157 m^{-1}}{4} \approx 160 m^{-1}$

3. Find angular frequency $\omega$: $\omega = kV$. $V$ is velocity: $V = \frac{\Delta d}{\Delta t}$.

   $\Delta d = d = 3.16$ m, $\Delta t = 1.00$ ms. $= 0.0010 s$

   $\therefore \omega = k \frac{\Delta d}{\Delta t} = \left(\frac{157 m^{-1}}{0.0316 m}\right) \frac{0.0316 m}{0.0010 s} = 49618 s^{-1} \approx 5000 s^{-1}$

4. Wave move along positive x axis. We must use the minus sign in $kx - \omega t$.

   $\therefore Y(x,t) = (2.00 \text{ mm}) \sin \left[ \left( \frac{160 m^{-1}}{} \right) x - (5000 s^{-1}) t \right]$

2. From the figure, we see that the resultant wave is a sinusoidal wave that moves in the positive direction of the x axis. A first key idea here is that the interfering waves must both move in that direction, and then we can write them as:

   $Y_1 (x,t) = Y_m \sin(kx - \omega t)$
   $Y_2 (x,t) = Y_m \sin(kx - \omega t + \phi)$

   where $Y_m = 4.0$ mm.