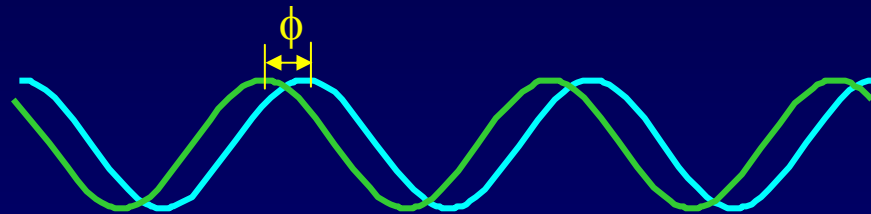


# Review: Adding Sine Waves

Suppose we have two sinusoidal waves with the same  $A_1$ ,  $\omega$ , and  $k$ .  
Suppose one starts at phase  $\phi$  after the other:

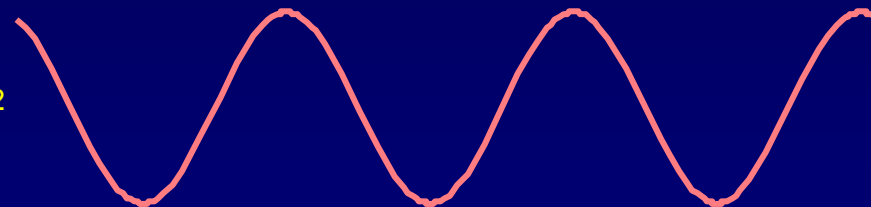
$$y_1 = A_1 \cos(kx - \omega t) \quad \text{and} \quad y_2 = A_1 \cos(kx - \omega t + \phi)$$

Spatial dependence  
of 2 waves at  $t = 0$ :



Resultant wave:

$$y = y_1 + y_2$$



Use this trig identity:

$$A_1 (\cos \alpha + \cos \beta) = 2A_1 \cos\left(\frac{\beta - \alpha}{2}\right) \cos\left(\frac{\beta + \alpha}{2}\right)$$

$\downarrow$   $\downarrow$   $\downarrow$   
 $y_1 + y_2$   $(\phi/2)$   $(kx - \omega t + \phi/2)$

$$y = 2A_1 \cos(\phi/2) \cos(kx - \omega t + \phi/2)$$

Amplitude

Oscillation