

13.7 Translating Sine + Cosine

$$y = a \sin bx, \quad y = a \cos bx$$

$$y = a \sin b(x-h) + k$$

(ex) $y = -3 \sin 2\left(x - \frac{\pi}{3}\right) - \frac{3}{2}$

$a = |-3| = 3$ $b = 2$ use b to get period
amplitude = 3 $P = \frac{2\pi}{b} = \frac{2\pi}{2} = \pi$
Period = π

increments = Period \div 4 (or multiply $\frac{1}{4}$)

increments = $\frac{\pi}{4}$

$$x - \frac{\pi}{3} = 0$$

$\begin{matrix} +\frac{\pi}{3} & +\frac{\pi}{3} \\ \uparrow & \uparrow \end{matrix}$

$x = \frac{\pi}{3}$ shift right $\frac{\pi}{3}$

shift down $-\frac{3}{2}$

* If k is positive shifts up.

* If k is negative it shifts down.

* If a is negative there is a reflection.

$$y = a \cos b(x-h) + k$$

$$\textcircled{2} \quad y = 2 \cos \frac{\pi}{2}(x+1) - 3$$

$$\text{amp} = |2| = 2$$

$$\text{period} = \frac{2\pi}{\pi/2} = 2\pi \cdot \frac{2}{\pi} = 4$$

$$\begin{aligned} x+1 &= 0 \\ -1 & -1 \\ x &= -1 \end{aligned}$$

$$\text{increments} = \frac{4}{4} = 1$$

shifts

left one
down 3

$$\textcircled{3} \quad y = 1 \sin \overset{b}{\underset{\downarrow}{3}} \left(x - \frac{\pi}{2} \right) - \frac{1}{2}$$

$$\text{amp} = 1$$

$$p = \frac{2\pi}{3}$$

$$\text{increments} = \frac{2\pi}{3} \cdot \frac{1}{4} = \frac{\pi}{6}$$

shifts: right $\frac{\pi}{2}$, down $\frac{1}{2}$

$$\frac{2\pi \cdot 2}{3 \cdot 2}$$

$$\frac{\pi}{6}$$

$$\frac{\pi \cdot 3}{2 \cdot 3}$$

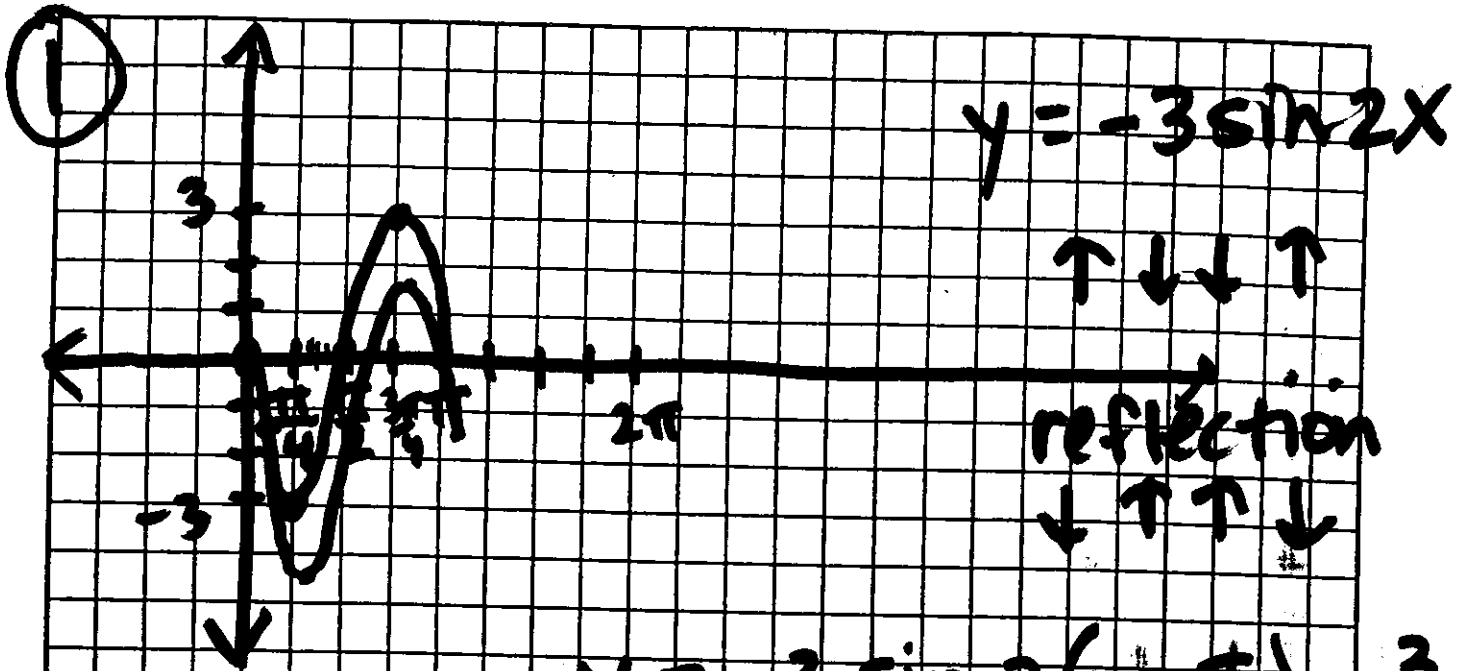
$$\frac{4\pi}{6}$$

$$\frac{\pi}{6}$$

$$\frac{3\pi}{6}$$

Grid for Scale Drawings

Scale 1/4"=1'



$$y = -3 \sin 2\left(x - \frac{\pi}{3}\right) - \frac{3}{2}$$

take each point → right $\frac{\pi}{3}$, down 1.5

calculator:

$$y = -3 \sin\left(2\left(x - \frac{\pi}{3}\right)\right) - \left(\frac{3}{2}\right)$$

$\frac{3\pi}{12}$ $\frac{4\pi}{12}$ $\frac{5\pi}{12}$ $\frac{6\pi}{12}$

$\frac{3\pi}{12}$ $\frac{4\pi}{12}$ $\frac{6\pi}{12}$

Grid for Scale Drawings

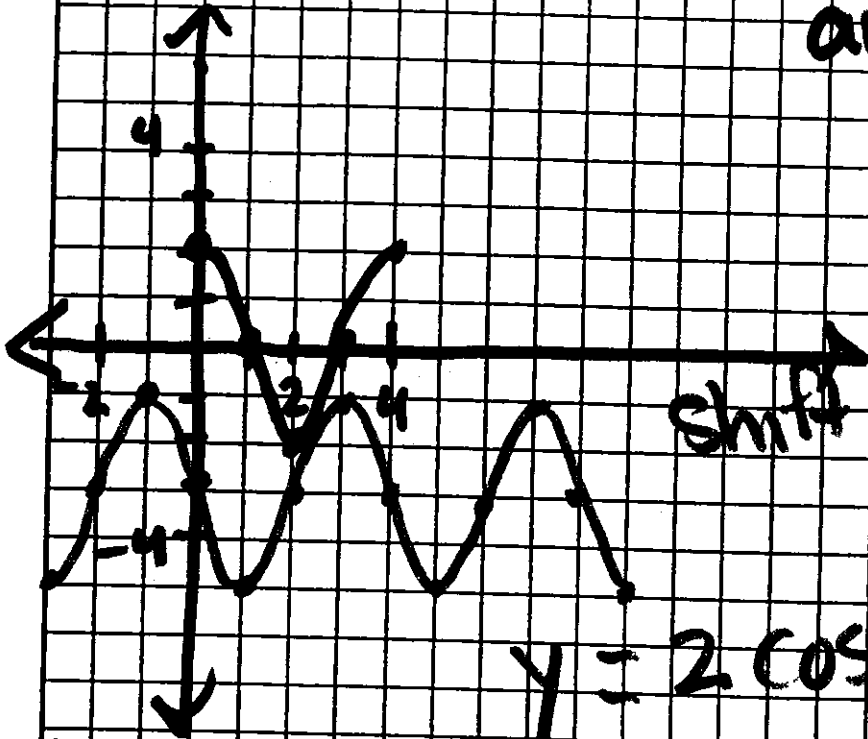
Scale 1/4"=1'

②

$$y = 2 \cos \frac{\pi}{2} x$$

Basic before
any shifts

$$\downarrow \frac{\pi}{2} \quad \downarrow \frac{\pi}{2} \quad \uparrow \frac{\pi}{2} \quad \uparrow \frac{\pi}{2}$$



shift left 1
down 3

$$y = 2 \cos \frac{\pi}{2} (x+1) - 3$$

calculator:

$$y = 2 \cos \left(\left(\frac{\pi}{2} \right) (x+1) \right) - 3$$

Grid for Scale Drawings
Scale 1/4"=1'

$$y = \sin 3x$$

