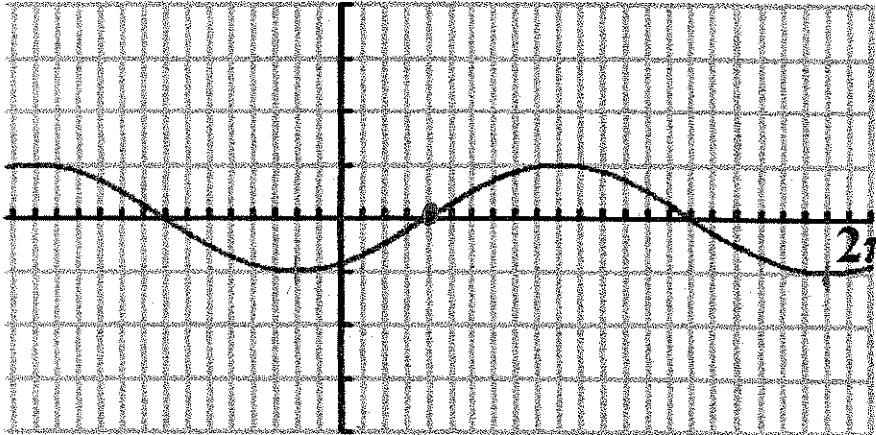


### Writing Equations for Sine and Cosine

For #'s 1-6, write an equation that could model the following transformations of  $y = \sin x$ .

1.



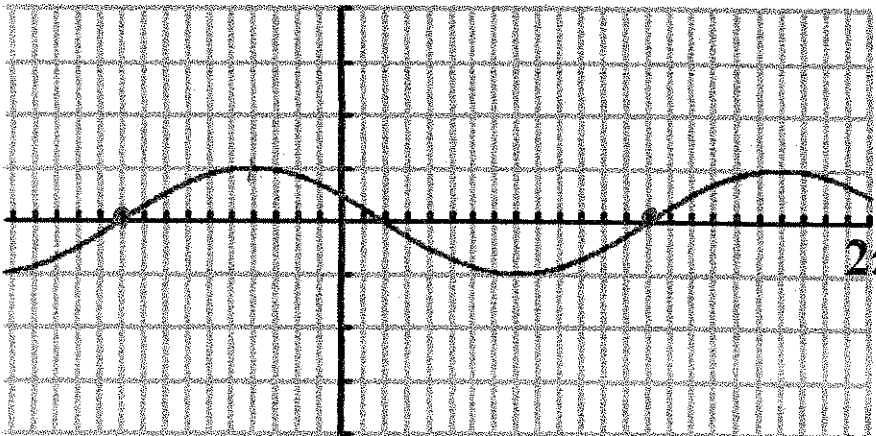
Compare each new graph to your graph of  $\sin x$ !

$$y = \sin(\theta - \frac{\pi}{3})$$

Period =  $2\pi$       4 to the right =  $\frac{4\pi}{12} = \frac{\pi}{3}$

$$\frac{2\pi}{24} = \frac{\pi}{12}$$

2.

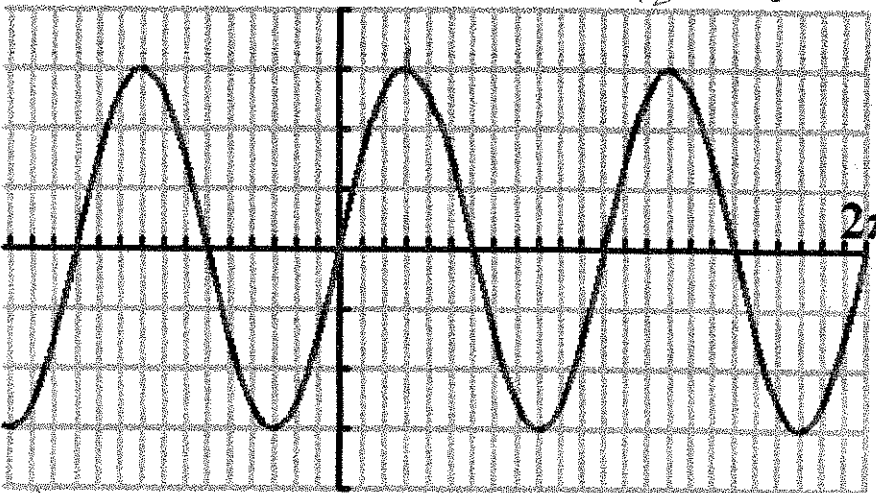


$$y = \sin(\theta - \frac{5\pi}{6})$$

Period =  $2\pi$       10 to right =  $\frac{10\pi}{12} = \frac{5\pi}{6}$   
 or  
 14 left =  $\frac{14\pi}{12} = \frac{7\pi}{6}$

$$\frac{2\pi}{24} = \frac{\pi}{12}$$

3.

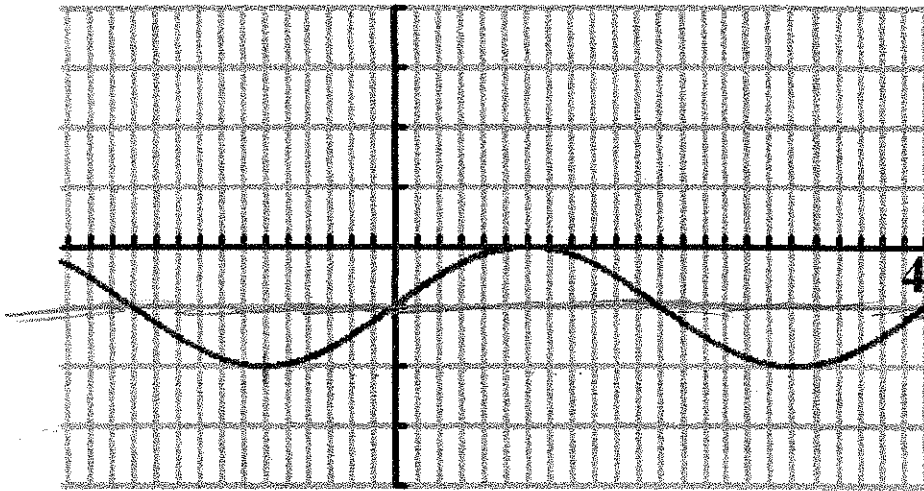


$$y = 3\sin 2\theta$$

Period =  $\frac{12\pi}{12} = \pi$        $\frac{2\pi}{b} = \pi$ ,  $b = 2$

$$\frac{2\pi}{24} = \frac{\pi}{12}$$

4.

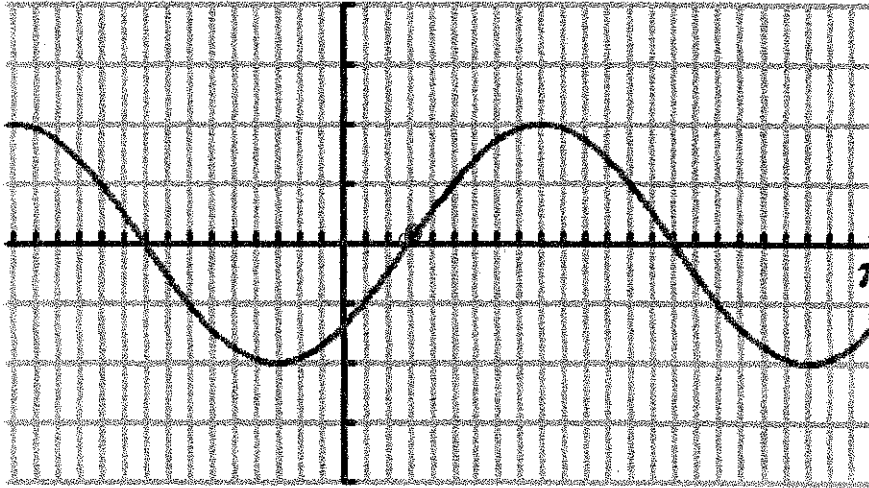


$$y = -1 + \sin \frac{1}{2} \theta$$

$$\frac{4\pi}{24} = \frac{\pi}{6}$$

$$\frac{24\pi}{6} = 4\pi \quad 4\pi = \frac{2\pi}{b} \quad b = \frac{1}{2}$$

5.

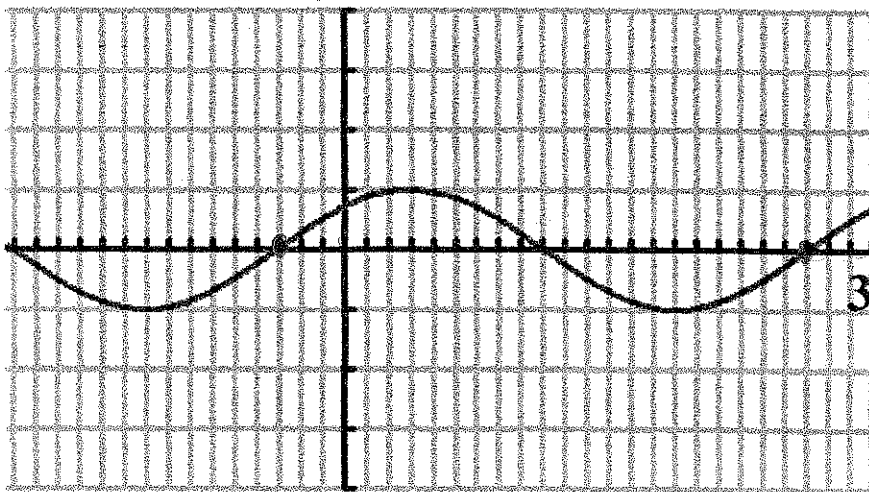


$$y = 2 \sin 2 \left( \theta - \frac{\pi}{8} \right)$$

$$\frac{\pi}{24}$$

$$\frac{24\pi}{24} = \pi \quad \frac{2\pi}{k} = \pi \quad \text{Right} \quad \frac{3\pi}{24} = \frac{\pi}{8}$$

6.



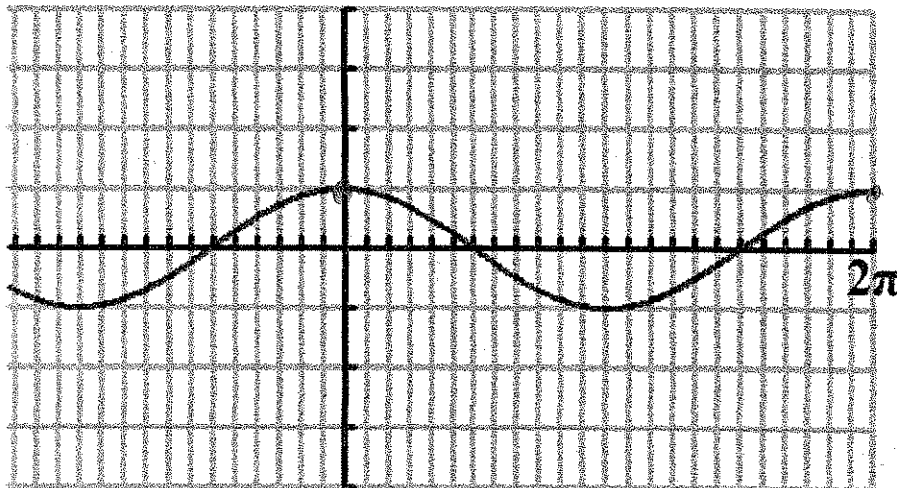
$$y = \sin \frac{2}{3} \left( \theta + \frac{3\pi}{8} \right)$$

$$\frac{3\pi}{24} = \frac{\pi}{8}$$

$$\text{Period: } 3\pi \quad \frac{2\pi}{b} = 3\pi \quad \left( b = \frac{2}{3} \right) \quad \text{Shift left: } \frac{3\pi}{8} \text{ units}$$

For #'s 7-12, write an equation that could model the following transformations of  $y = \cos x$ .

7.



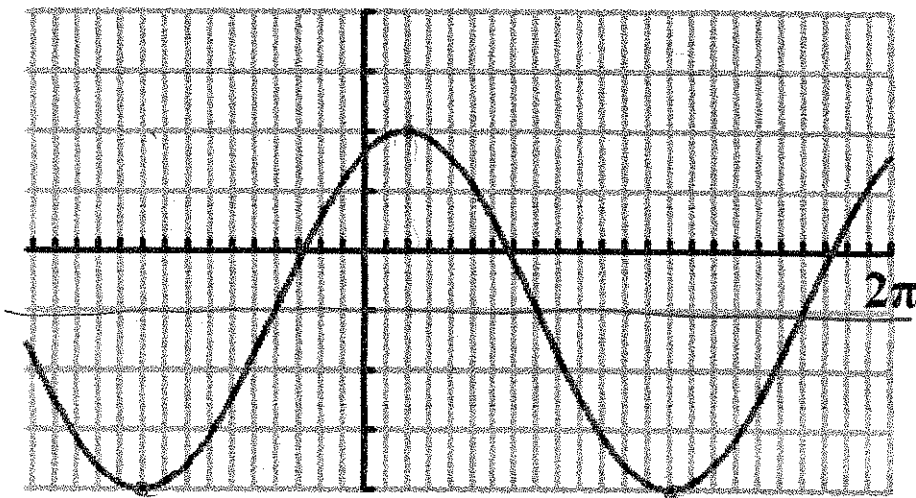
Period:  $2\pi$

$$y = \cos(\theta \pm 2\pi)$$

This may not look like a transformation, but it is. What transformation would be equivalent to the original graph of  $\cos x$ ?

$$y = \cos \theta$$

8.



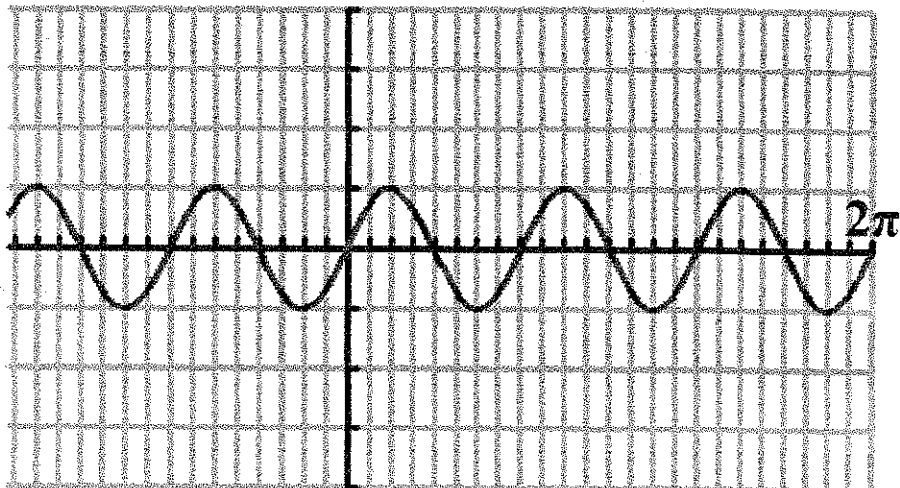
Period:  $2\pi$

Shift right:  $\frac{2\pi}{12} = \frac{\pi}{6}$

$$y = 3 \cos\left(\theta - \frac{\pi}{6}\right)$$

$$\frac{2\pi}{24} = \frac{\pi}{12}$$

9.



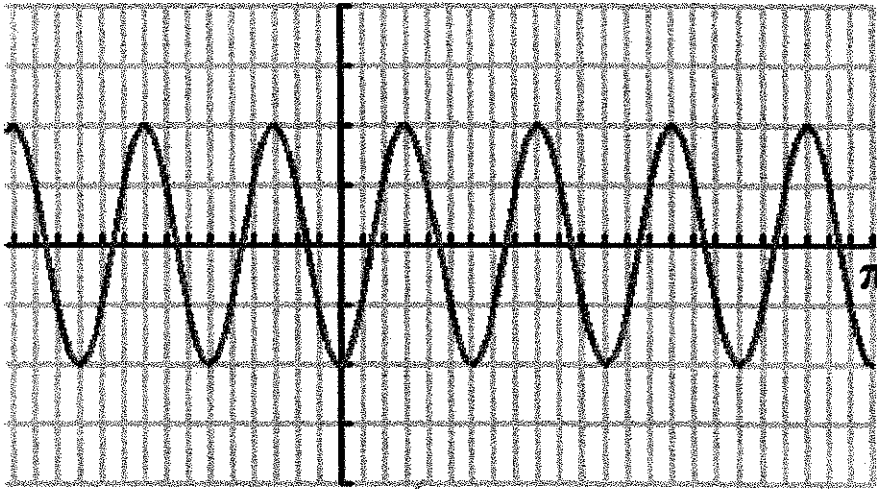
Period:  $\frac{8\pi}{12} = \frac{2\pi}{3}$

$$\frac{2\pi}{b} = \frac{2\pi}{3} \quad (b=3)$$

$$y = \cos 3\left(\theta - \frac{\pi}{6}\right)$$

$$\frac{2\pi}{24} = \frac{\pi}{12}$$

10.



$$y = 2 \cos 8\left(\theta - \frac{\pi}{8}\right)$$

$$\frac{\pi}{24}$$

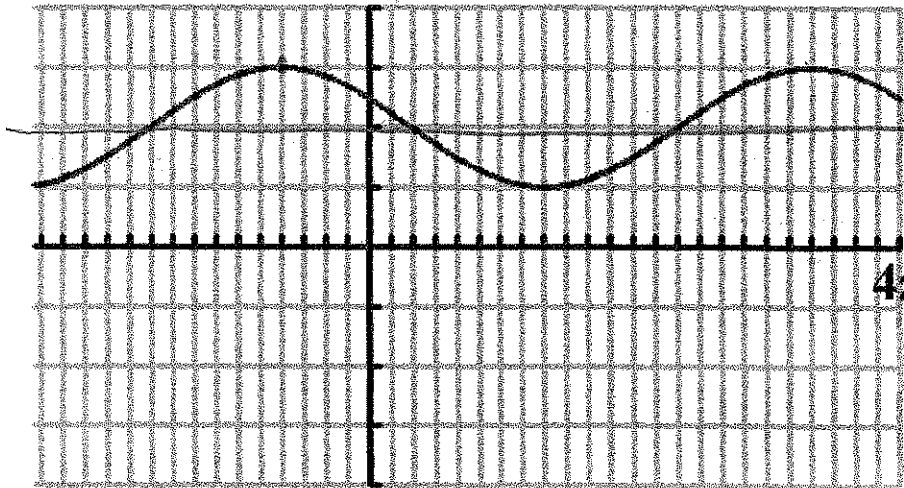
or

$$y = -2 \cos 8\theta$$

Period:  $\frac{6\pi}{24} = \frac{\pi}{4}$  /  $\frac{2\pi}{b} = \frac{\pi}{4}$  ( $b=8$ )

Shift right:  $\frac{3\pi}{24} = \frac{\pi}{8}$

11.



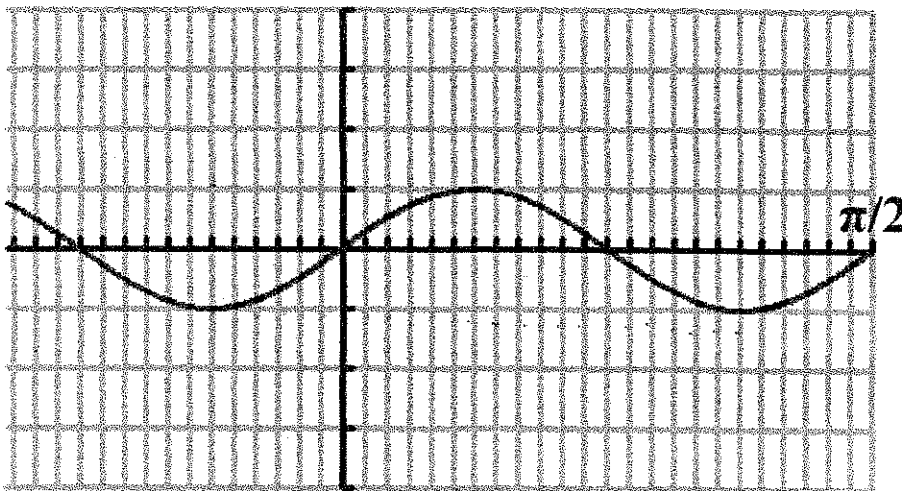
$$y = 2 + \cos \frac{1}{2}\left(\theta - \frac{10\pi}{3}\right)$$

$$\frac{4\pi}{24} = \frac{\pi}{6}$$

Period:  $\frac{24\pi}{6} = 4\pi$  /  $\frac{2\pi}{b} = 4\pi$  ( $b = \frac{1}{2}$ )

Shift right:  $\frac{20\pi}{6} = \frac{10\pi}{3}$

12.



$$y = \cos 4\left(\theta - \frac{\pi}{8}\right)$$

$$y = -\cos 4\left(\theta + \frac{\pi}{8}\right)$$

$$\frac{\frac{\pi}{2}}{24} = \frac{\pi}{48}$$

Period:  $\frac{24\pi}{48} = \frac{\pi}{2}$  /  $\frac{2\pi}{b} = \frac{\pi}{2}$  ( $b=4$ )

Shift right =  $\frac{6\pi}{48} = \frac{\pi}{8}$