

Graphs of Trig Functions

1. a) $\boxed{-82^\circ}$ b) $998 - 82 = \boxed{1080^\circ}$

2. a) $\frac{-7 - 24}{2} = \boxed{8.5}$ b) $\frac{-7 + 24}{2} = \boxed{-15.5}$

3. $y = 3 \sin\left(\frac{x}{4} + \frac{\pi}{12}\right) - 1$

amp $\boxed{3}$

period $\frac{2\pi}{b} = \frac{2\pi}{1/4} = 2\pi \cdot 4 = \boxed{8\pi}$

vs $\boxed{-1}$

ps $\frac{x}{4} + \frac{\pi}{12} = 0$ (4) $\frac{x}{4} = -\frac{\pi}{12}$ (4) $\boxed{x = -\frac{\pi}{3}}$

4. $y = -2 \cos(3\theta - 120^\circ) + 2$

amp $\boxed{2}$

period $\frac{360}{b} = \frac{360}{3} = \boxed{120^\circ}$

vs $\boxed{2}$

ps $3\theta - 120 = 0$ $3\theta = 120$ $\boxed{\theta = 40^\circ}$

5. $y = -2 \sin\left(\frac{1}{3}x + \frac{\pi}{6}\right) + 1$

amp 2 period $\frac{2\pi}{1/3} = 2\pi \cdot 3 = 6\pi$

ps $\frac{1}{3}x + \frac{\pi}{6} = 0$ $\frac{1}{3}x + \frac{\pi}{6} = 2\pi$

(3) $\frac{1}{3}x = -\frac{\pi}{6}$ (3)

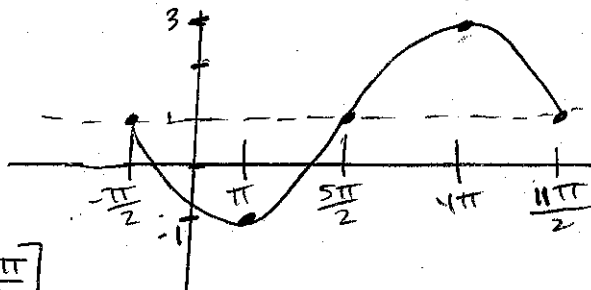
$x = -\frac{\pi}{2}$

$\frac{1}{3}x = \frac{12\pi}{6} - \frac{\pi}{6}$

(3) $\frac{1}{3}x = \frac{11\pi}{6}$ (3)
 $x = 11\pi/2$

Reflect

vs 1



D: $\left[-\frac{\pi}{2}, \frac{11\pi}{2}\right]$

R: $[-1, 3]$

$$\frac{-\pi}{2} \quad \pi \quad \frac{5\pi}{2} \quad 4\pi \quad \frac{11\pi}{2}$$

$$\frac{-\frac{\pi}{2} + \frac{11\pi}{2}}{2} = \frac{5\pi}{2}$$

$$\frac{-\frac{\pi}{2} + \frac{5\pi}{2}}{2} = \frac{2\pi}{2} = \pi$$

$$\frac{\frac{5\pi}{2} + \frac{11\pi}{2}}{2} = \frac{8\pi}{2} = 4\pi$$

$$6. \quad y = 3 \cos(2\theta - 120^\circ) - 2$$

amp 3

vs -2

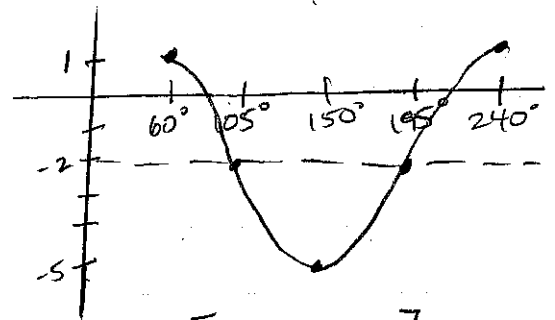
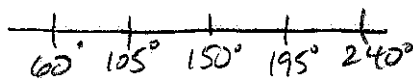
period $\frac{360}{2} = 180^\circ$

Phase Shift

$$2\theta - 120 = 0 \quad 2\theta - 120 = 360$$

$$2\theta = 120 \quad 2\theta = 480$$

$$\theta = 60^\circ \quad \theta = 240^\circ$$



$$D: [60^\circ, 240^\circ]$$

$$R: [-5, 1]$$

$$7. \quad y = 4 \cos(2\theta)$$

amp 4

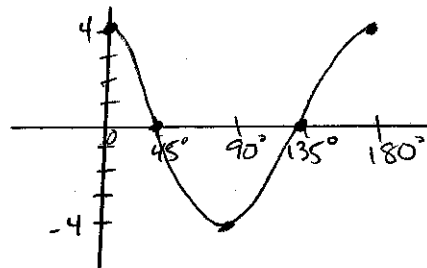
vs none

period $\frac{360}{2} = 180^\circ$

Phase Shift: none

$$2\theta = 0 \quad 2\theta = 360^\circ$$

$$\theta = 0^\circ \quad \theta = 180^\circ$$



$$D: [0, 180^\circ]$$

$$R: [-4, 4]$$

$$8. \quad y = \sin\left(3x - \frac{3\pi}{2}\right)$$

amp 1

vs none

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

phase shift

$$3x - \frac{3\pi}{2} = 0$$

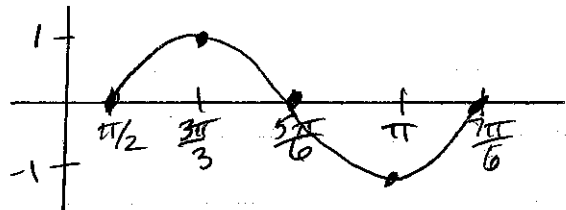
$$\left(\frac{1}{3}\right)3x = \frac{3\pi}{2} \left(\frac{1}{3}\right)$$

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

$$3x - \frac{3\pi}{2} = 2\pi$$

$$3x = \frac{4\pi}{2} + \frac{3\pi}{2}$$

$$\left(\frac{1}{3}\right)3x = \frac{7\pi}{2} \left(\frac{1}{3}\right) \quad x = \frac{7\pi}{6}$$



$$\frac{\frac{\pi}{2} + \frac{7\pi}{6}}{2} = \frac{\frac{3\pi}{6} + \frac{7\pi}{6}}{2} = \frac{10\pi}{6} \cdot \frac{1}{2} = \frac{5\pi}{6}$$

$$\frac{\frac{\pi}{2} + \frac{5\pi}{6}}{2} = \frac{\frac{3\pi}{6} + \frac{5\pi}{6}}{2} = \frac{8\pi}{6} \cdot \frac{1}{2} = \frac{2\pi}{3}$$

$$\frac{\frac{5\pi}{6} + \frac{7\pi}{6}}{2} = \frac{12\pi}{6} \cdot \frac{1}{2} = \frac{6\pi}{6} = \pi$$

$$9. y = -2 \cos\left(\frac{1}{2}x + \frac{5\pi}{6}\right) - 2$$

Reflect

amp 2

$$\text{period } \frac{2\pi}{1/2} = 2\pi \cdot 2 = 4\pi$$

vs -2

Phase Shift

$$\frac{1}{2}x + \frac{5\pi}{6} = 0$$

$$\frac{1}{2}x + \frac{5\pi}{6} = 2\pi$$

$$(2) \frac{1}{2}x = -\frac{5\pi}{6} (2)$$

$$\frac{1}{2}x = \frac{12\pi}{6} - \frac{5\pi}{6}$$

$$x = -\frac{5\pi}{3}$$

$$(2) \frac{1}{2}x = \frac{7\pi}{6} (2)$$

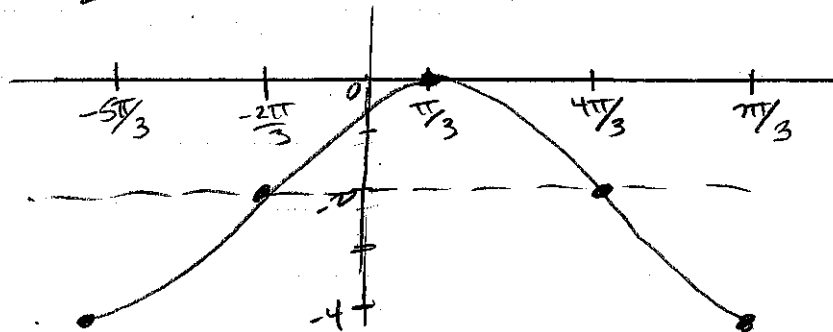
$$x = \frac{7\pi}{3}$$

$$\frac{-5\pi}{3} \quad \frac{-2\pi}{3} \quad \frac{\pi}{3} \quad \frac{4\pi}{3} \quad \frac{7\pi}{3}$$

$$\frac{-5\pi}{3} + \frac{7\pi}{3} = \frac{2\pi}{3} \cdot \frac{1}{2} = \frac{\pi}{3}$$

$$\frac{-5\pi}{3} + \frac{\pi}{3} = -\frac{4\pi}{3} \cdot \frac{1}{2} = -\frac{2\pi}{3}$$

$$\frac{\pi}{3} + \frac{7\pi}{3} = \frac{8\pi}{3} \cdot \frac{1}{2} = \frac{4\pi}{3}$$



$$D: \left[-\frac{5\pi}{3}, \frac{7\pi}{3}\right] \quad R: [-4, 0]$$

$$10. \quad y = 3 \sin(3\theta - 45^\circ)$$

amp 3

period $\frac{360}{3} = 120^\circ$

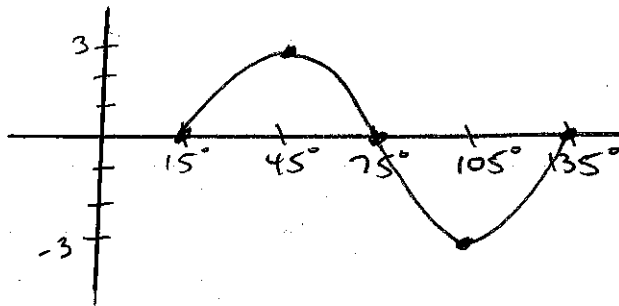
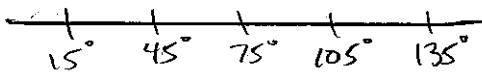
VS none

phase shift

$$3\theta - 45 = 0 \quad 3\theta - 45 = 360$$

$$3\theta = 45 \quad 3\theta = 405$$

$$\theta = 15^\circ \quad \theta = 135^\circ$$



$$D: [15^\circ, 135^\circ]$$

$$R: [-3, 3]$$