

9D: # 5c, 12, 13, 14abde, 15, 16bc, 17cd, 18bc

5c.)  $y = -2 \cos x - 4$     max:  $-4 + 2 = \boxed{-2}$     min:  $-4 - 2 = \boxed{-6}$

12.)  $y = 4 \sin 3x + 2$     amplitude:  $\boxed{4}$     period:  $\frac{360}{3} = \boxed{120^\circ}$     range:  $2 + 4 = 6$   
 $2 - 4 = -2$

13.) a.)  $y = 2 \sin 3x$     b.)  $y = 3 \sin x - 5$     c.)  $y = -2 \sin x$

$\left. \begin{array}{l} \text{- vertical stretch by 2} \\ \text{- horizontal stretch by } \frac{1}{3} \end{array} \right\}$      $\left. \begin{array}{l} \text{- vertical stretch by 3} \\ \text{- translation 5 units down} \end{array} \right\}$      $\left. \begin{array}{l} \text{- reflection across x-axis} \\ \text{- vertical stretch by 2} \end{array} \right\}$

$\boxed{-2 \leq y \leq 6}$



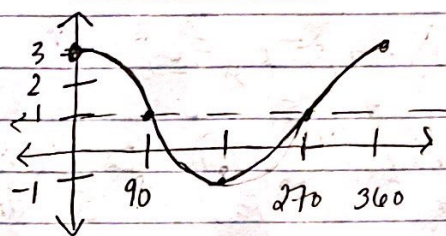
17c.) principal axis: 0  
 amplitude: 2  
 -reflected (starts down)  
 period:  $180^\circ \therefore b=2$   
 $y = -2 \sin(2x)$

17d.) principal axis: 1  
 amplitude: 2  
 period:  $360^\circ$   
 $y = 2 \sin x + 1$

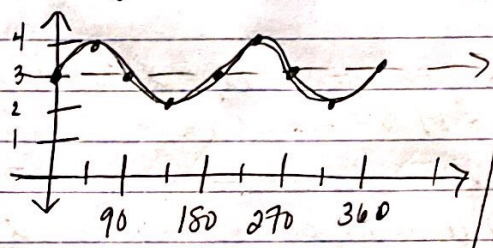
18b.) principal axis: 2  
 amplitude: 1  
 period:  $720^\circ$   
 $-b = \frac{1}{2}$   
 $y = \cos(\frac{1}{2}x) + 2$

18c.) reflected (starts down)  
 amplitude: 5  
 period:  $90^\circ$   
 $\therefore b=4$   
 $y = -5 \cos(4x)$

14) a.)  $y = 2 \cos x + 1$   
 principal axis = 1  
 range:  $-1 \leq y \leq 3$

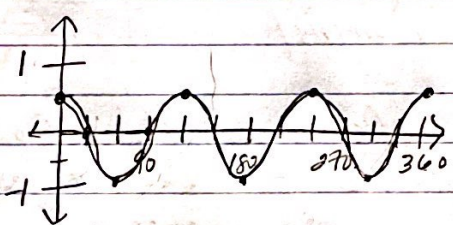


b.)  $y = \sin 2x + 3$   
 period:  $180^\circ$   
 principal axis = 3  
 range:  $2 \leq y \leq 4$

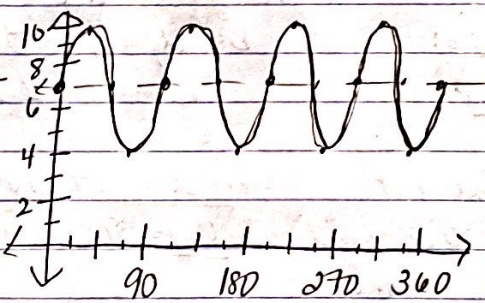


d.)  $y = \frac{1}{2} \cos 3x$

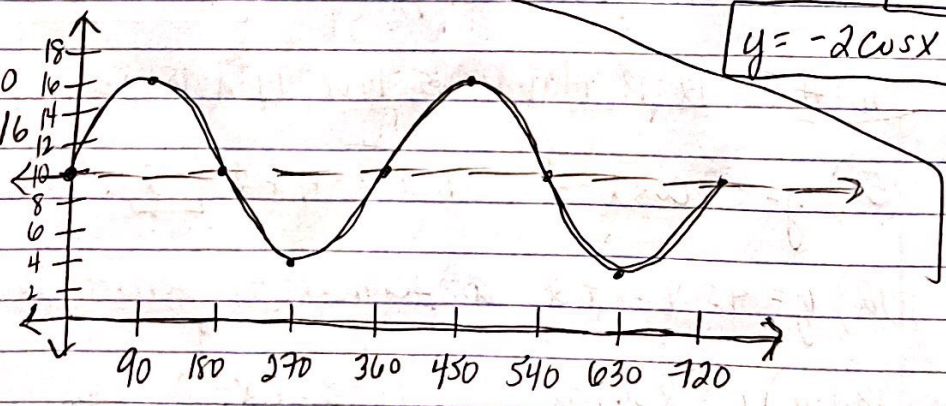
period:  $120^\circ$   
 principal axis = 0  
 range:  $-\frac{1}{2} \leq y \leq \frac{1}{2}$



e.)  $y = 3 \sin 4x + 7$   
 period:  $90^\circ$   
 principle axis = 7  
 range:  $4 \leq y \leq 10$



15.)  $y = 6 \sin x + 10$   $0^\circ \leq x \leq 720^\circ$   
 period:  $360^\circ$   
 principal axis: 10  
 range:  $4 \leq y \leq 16$



b.)  $6 \sin(30) + 10$   
 $6(\frac{1}{2}) + 10$   
 $y = 13$

c.) max: 16 @  $90^\circ, 450^\circ$   
 d.) min: 4 @  $270^\circ, 630^\circ$

16b.)  $f(x) = a \cos 2x + d$   
 $(30^\circ, \frac{1}{2})$  &  $(90^\circ, -4)$

$$\frac{1}{2} = a \cos(60^\circ) + d$$

$$\Rightarrow (\frac{1}{2} = \frac{1}{2}a + d) \quad (2)$$

$$-4 = a \cos(180^\circ) + d$$

$$\Rightarrow -4 = -a + d$$

$$+1 = a + 2d$$

$$-3 = 3d \quad \therefore d = -1$$

$$\Rightarrow 1 = a + 2(-1) \quad \therefore a = 3$$

$$f(x) = 3 \cos 2x - 1$$

16c.)  $f(x) = a \cos x + d$   
 $(60^\circ, 2), (180^\circ, 5)$

$$2 = a \cos(60^\circ) + d$$

$$2 = \frac{1}{2}a + d \Rightarrow 4 = a + 2d$$

$$5 = a \cos(180^\circ) + d$$

$$5 = -a + d \quad \therefore d = 3$$

$$+4 = a + 2d \quad 4 = a + 6$$

$$a = 3d \quad \therefore a = -2$$

$$y = -2 \cos x + 3$$