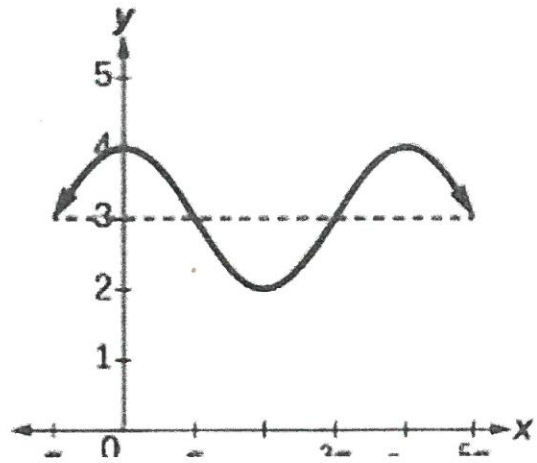
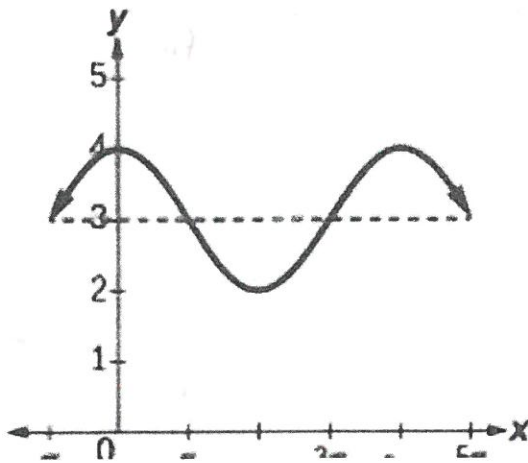


## Section 3-2 Sinusoidal Graphs

$$y = C + A \cos B(\theta - D) \quad \text{or} \quad y = C + A \sin B(\theta - D)$$

- C is the location of the sinusoidal axis (vertical translation up or down)
- |A| is the amplitude (or vertical dilation, which can be positive or negative if graph upside down)
- B is how you find the period ( $360^\circ / B$ )
- D is the phase displacement (horizontal translation left or right)



Graph.

1.  $y = 4 + 3 \cos 2(\theta - 70^\circ)$

vt sinusoidal axis:  $y = 4$

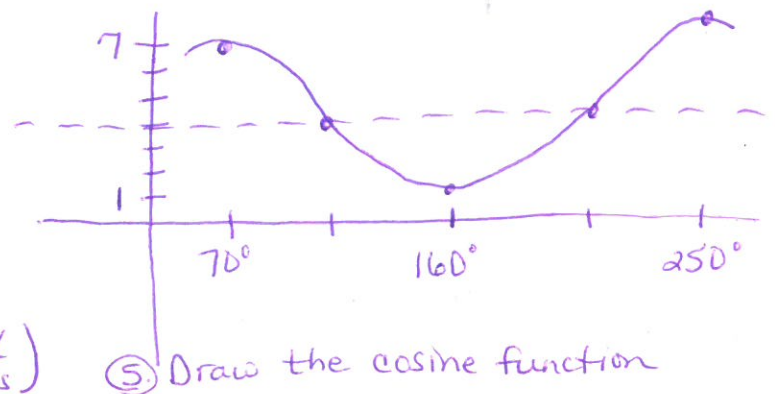
vd amplitude: 3

hd period:  $180^\circ$       $360^\circ * hd = \text{period}$  ;  $360^\circ * \frac{1}{2} = \text{period}$  ;  $180^\circ = \text{period}$

ht phase displacement:  $70^\circ$

Graph in this order:

- ① sinusoidal axis (dashed)
- ② amplitude (mark on y-axis)
- ③ phase disp. (mark on x-axis)
- ④ period (add to phase disp. mark x-axis)



⑤ Draw the cosine function

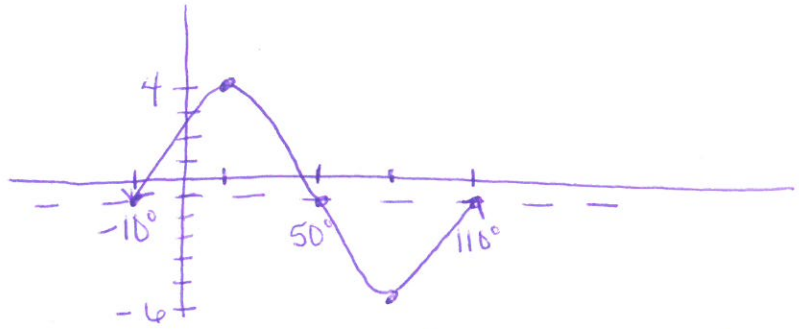
2.  $y = -1 + 5\sin 3(\theta + 10^\circ)$

vt sinusoidal axis:  $-1$

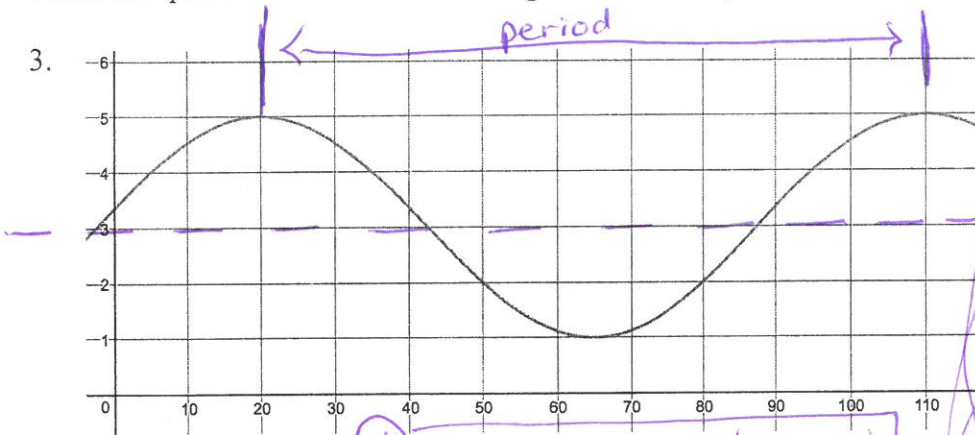
vd amplitude:  $5$

hd period:  $120^\circ$   $360^\circ \times hd = \text{period}$ ;  $360^\circ \times \frac{1}{3} = \text{period}$   $120^\circ = \text{period}$

ht phase displacement:  $-10^\circ$



Write an equation for the sinusoid using cosine or sine, whichever seems easier.



① Steps:

- ① find sin. axis (vt)
- ② find amp (vd)
- ③ find beg of sine or cosine function (ht)

- ④ find the period & use it to find hd

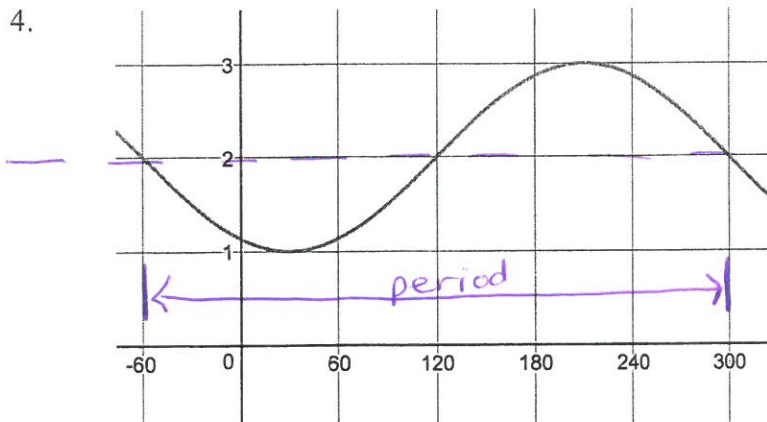
How to: ②

- ①  $\frac{1}{2}$  b/w max & min
- ② distance from sinusoidal axis to top (max) or bottom (min)
- ③ start @ sin. axis for sine @ max for cosine
- ④ go from high pt to high pt

③

- ① Sin. axis  $\rightarrow y = 3$
- ② amp  $\rightarrow 2$
- ③ phase disp  $\rightarrow 20^\circ$  right (for cosine)
- ④ period  $\rightarrow 90^\circ \rightarrow 360^\circ \times hd = 90^\circ$ ;  $hd = \frac{1}{4}$

④  $y = 3 + 2 \cos 4(\theta - 20^\circ)$



$y = 2 + 1 \sin 1(\theta - 120^\circ)$   
OR  
 $y = 2 + \sin(\theta - 120^\circ)$

- ① sin axis  $\rightarrow y = 2$
- ② amp  $\rightarrow 1$
- ③ phase disp.  $\rightarrow 120^\circ$  (for sine)
- ④ period  $\rightarrow 360^\circ \rightarrow 360^\circ \times hd = 360^\circ$ ;  $hd = 1$