I. Determine the maximum and minimum for each graph:

1.) $y = 2 + 3\cos(x + \frac{\pi}{2})$ Maximum ___5___   Minimum ___−1___

2.) $y = 4\sin(3x + \pi)$ Maximum ___4___   Minimum ___−4___

II For each, name the amplitude, period, vertical shift, and phase shift.
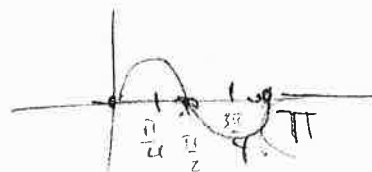
	Amplitude	period	vertical shift	phase shift
3.) $y = 3 - \frac{1}{4}\cos\frac{2}{3}x$	¼	3π	UP 3	None
4.) $y = 2\tan(3x - \frac{\pi}{3})$ $3(x - \frac{\pi}{9})$	None	$\pi/3$	None	Right $\pi/9$
5.) $y = 4\sin(3x + 2) - 1$ $3(x + 2/3)$	4	$2\pi/3$	down 1	left $2/3$

III. Determine all of the values of x on $0 \le x \le 2\pi$, where the curve crosses the x-axis.

6.) $y = 3\sin 2x$ $0, \frac{\pi}{2}, \pi, \frac{3\pi}{2}, 2\pi$
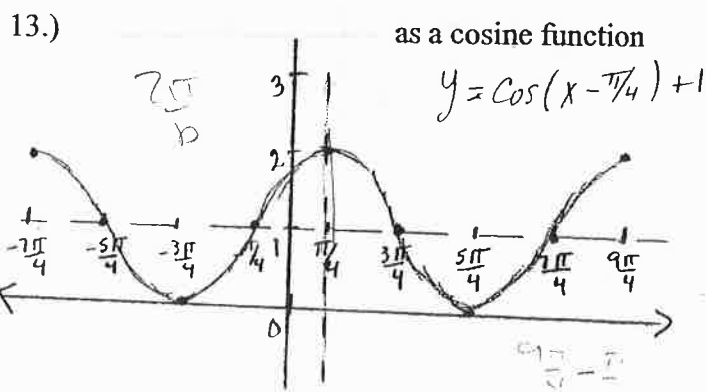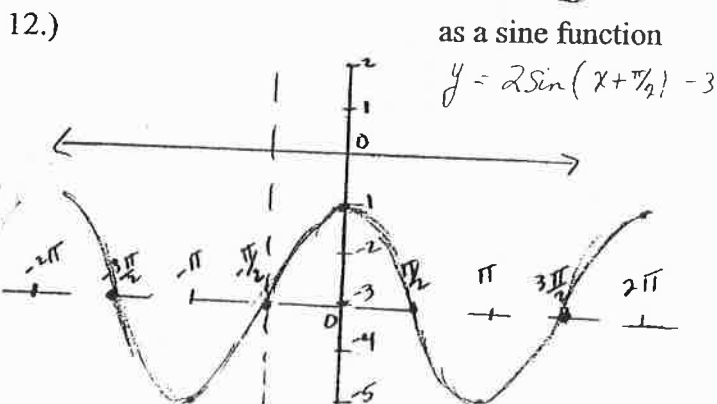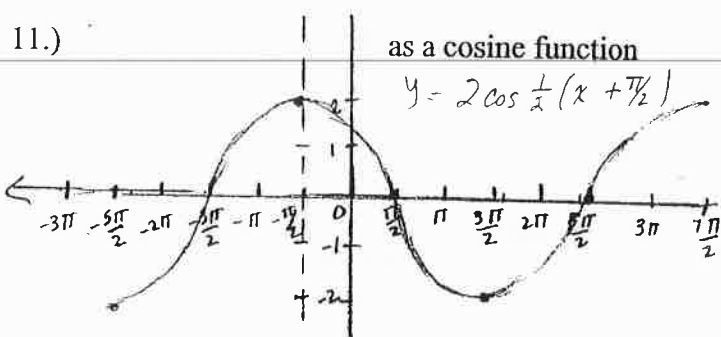

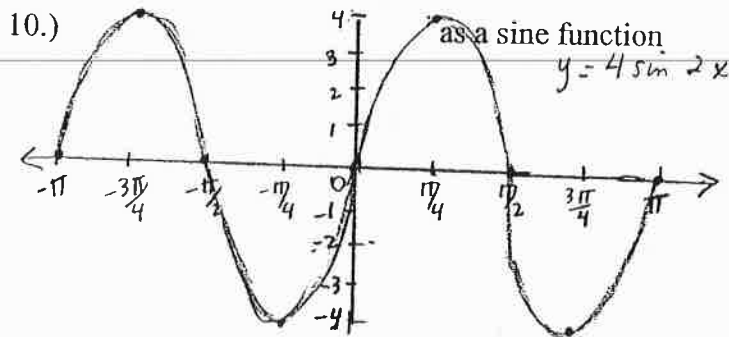IV. Write each curve in terms of a sin function.

   amp.$= \frac{3}{2}$; period $= \pi$; phase shift of $\frac{\pi}{4}$ left. $y = \frac{3}{2}\sin 2(x + \pi/4)$

8) amp. $= 2$; period $= 4\pi$; vertical shift down 3; phase shift $\frac{\pi}{2}$ left $y = 2\sin\frac{1}{2}(x + \pi/2) - 3$

9.) amp. $= 1$; period $= \frac{8\pi}{3}$; vertical shift up 1; flipped over x-axis $y = -\sin\frac{3}{4}x + 1$

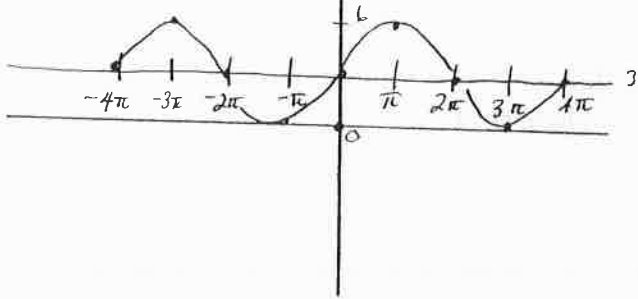$\frac{2\pi}{b} = \frac{8\pi}{3}$ $\frac{b8\pi}{8\pi} = \frac{6\pi}{8\pi}$ $b = \frac{3}{4}$

V. Write each as the indicated function.

10.)   as a sine function $y = 4\sin 2x$

11.)   as a cosine function $y = 2\cos\frac{1}{2}(x + \pi/2)$

12.)   as a sine function $y = 2\sin(x + \pi/2) - 3$

13.)   as a cosine function $y = \cos(x - \pi/4) + 1$
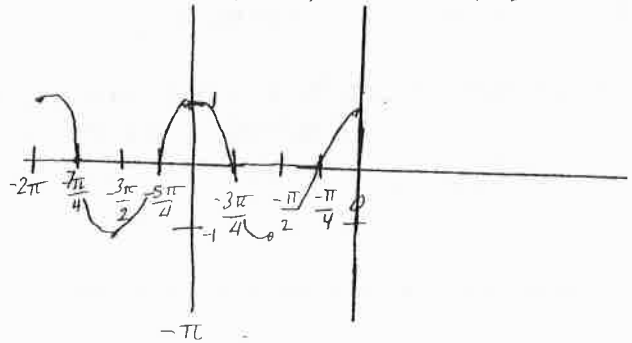
$\frac{2\pi}{b}$

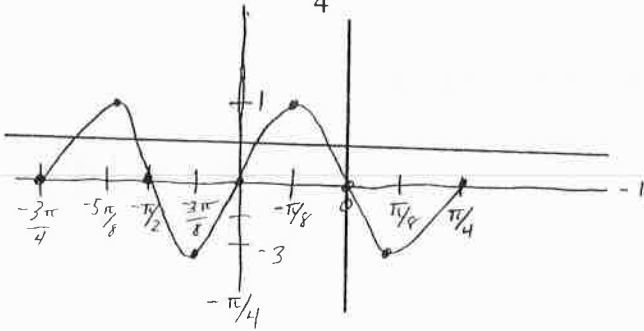''' Sketch each graph over more than one period.

14.) $y = 3 + 3\sin \dfrac{1}{2}x$ $Per = 4\pi$ $int = \pi$
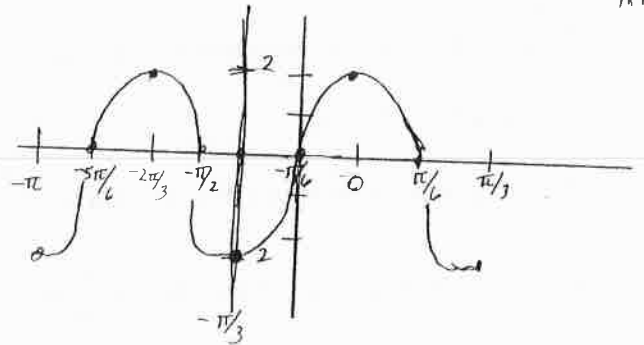

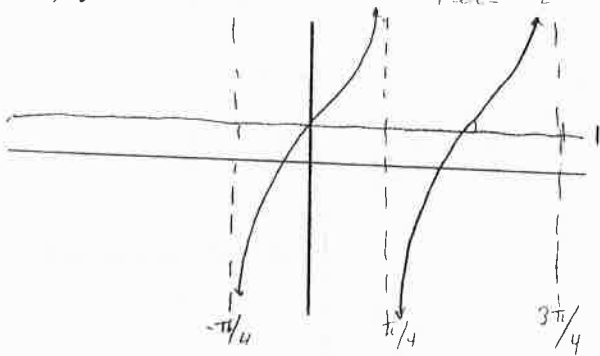15.) $y = \cos 2(x + \pi)$ $Per = \pi$ $int = \pi/4$

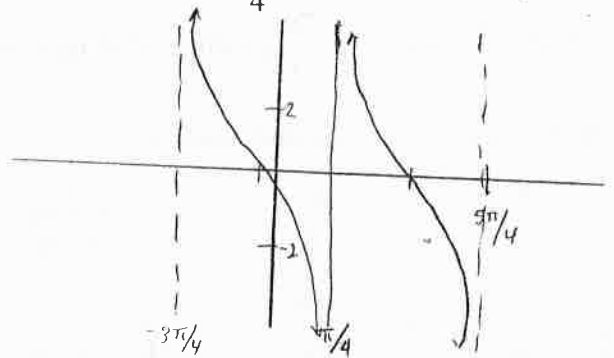16.) $y = 2\sin 4(x + \dfrac{\pi}{4}) - 1$ $Per = \pi/2$ $int = \pi/8$

17.) $y = -2\cos(3x + \pi) = -2\cos 3(x + \pi/3)$ $Per = \dfrac{2\pi}{3}$ $int = \pi/6$

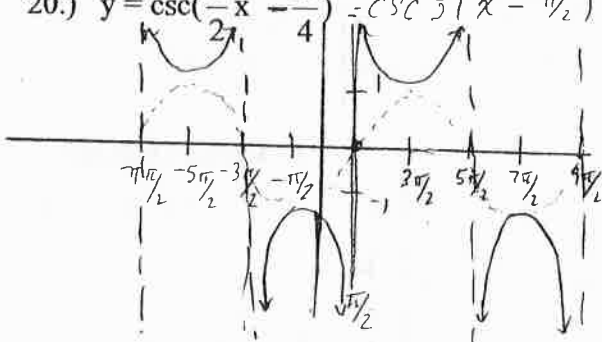18.) $y = 1 + \tan 2x$ $Per = \pi/2$

19.) $y = 2\cot(x - \dfrac{\pi}{4})$ $Per = \pi$

20.) $y = \csc(\dfrac{1}{2}x - \dfrac{\pi}{4}) = \csc \dfrac{1}{2}(x - \pi/2)$ $Per = 4\pi$ $int = \pi$

21) $y = \sec(x + \dfrac{3\pi}{4})$ $Per = 2\pi$ $int = \pi/2$