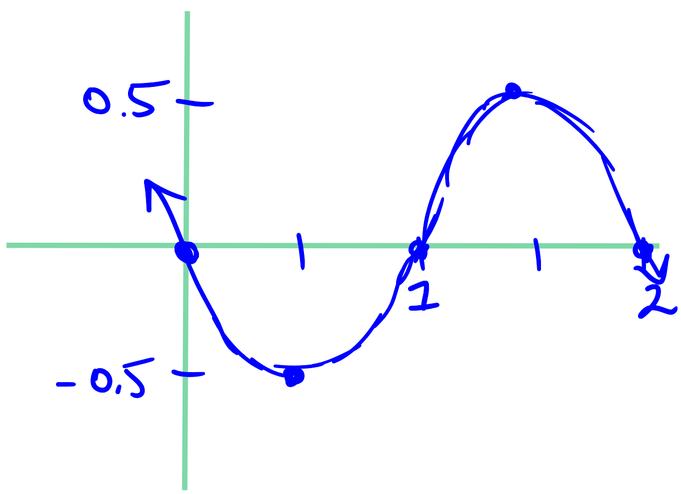
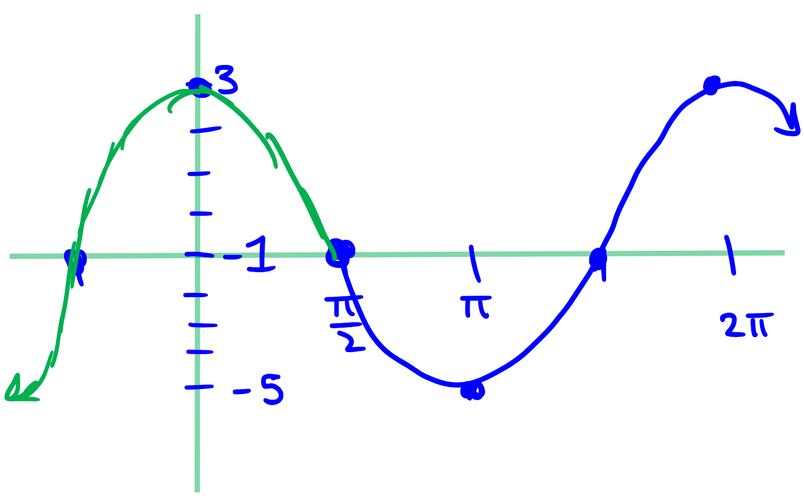
Sinusoidal Functions: Graphing Practice

Goal: Practice with the graphs of trig functions. Understand their characteristics (amplitude, period, midline, phase shift)

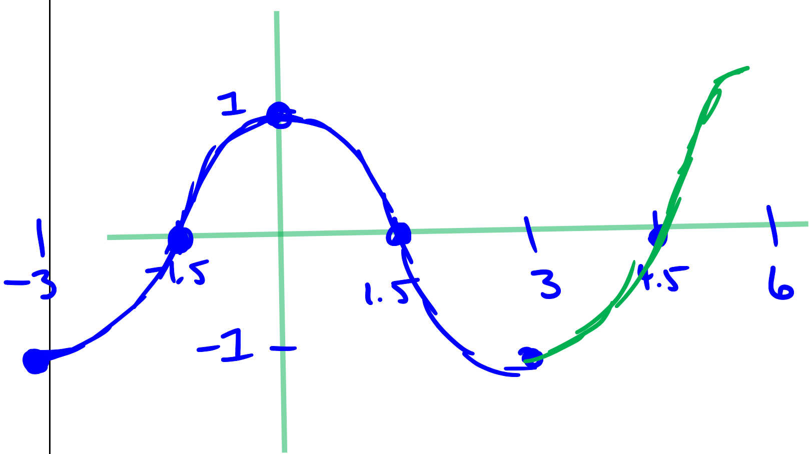
Graph the following sinusoidal functions.

1.	$y = \frac{1}{2}\sin(-\pi x)$ $= -\frac{1}{2}\sin(\pi x)$ amp $= \frac{1}{2}$ $T = 2$ 
2.	$y = -4\sin\left(x - \frac{\pi}{2}\right) - 1$ $T = 2\pi$ 

3.

$y = -\cos\left(-\frac{\pi}{4}(x+3)\right) = -\cos\left(\frac{\pi}{3}(x+3)\right)$

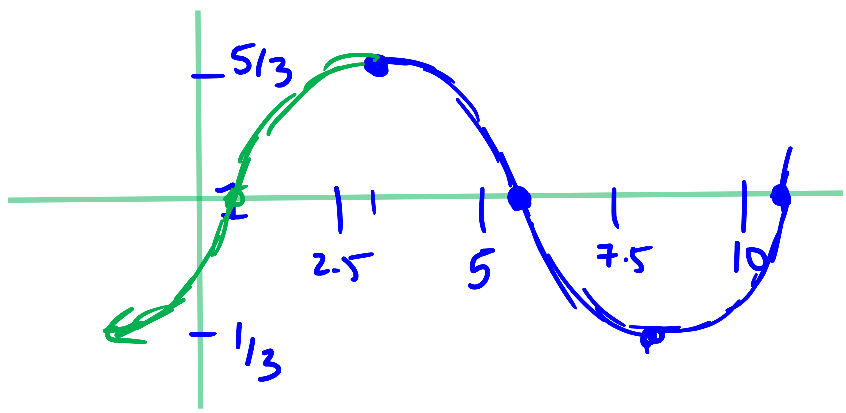
$T = \frac{2\pi}{\pi/3} = 6$



4.

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

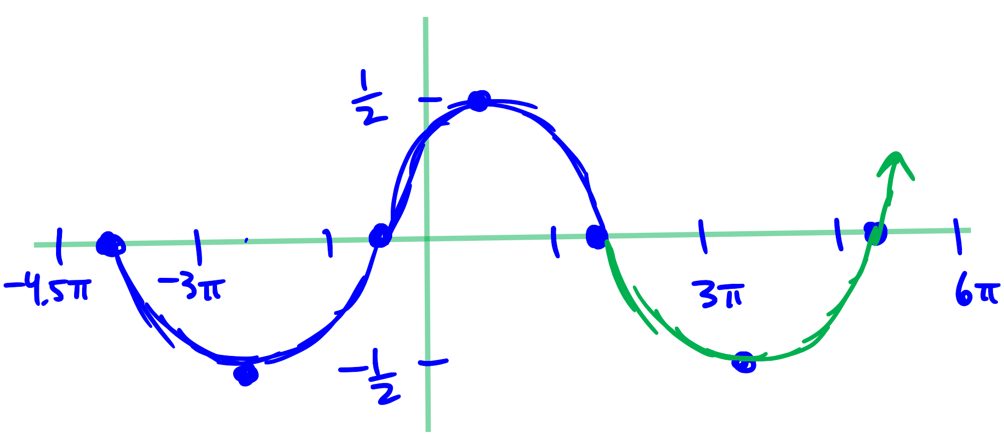
$T = \frac{2\pi}{\pi/5} = 10$

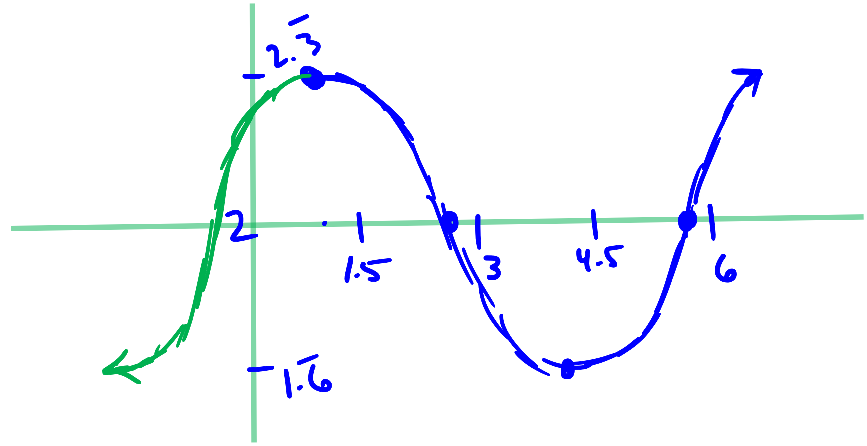
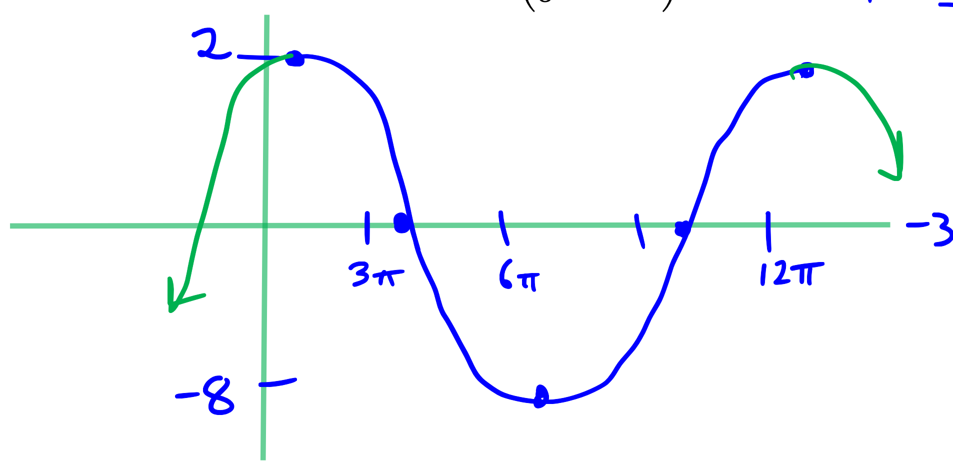
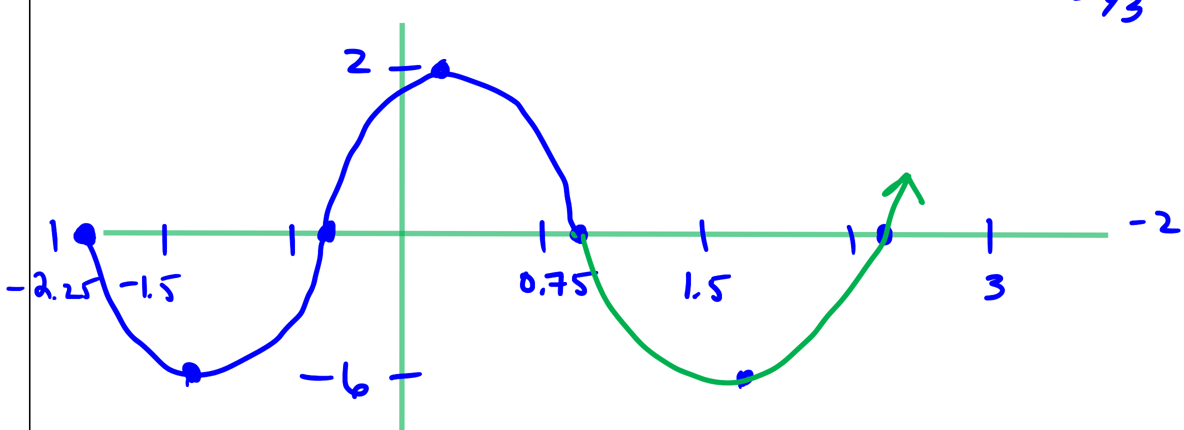


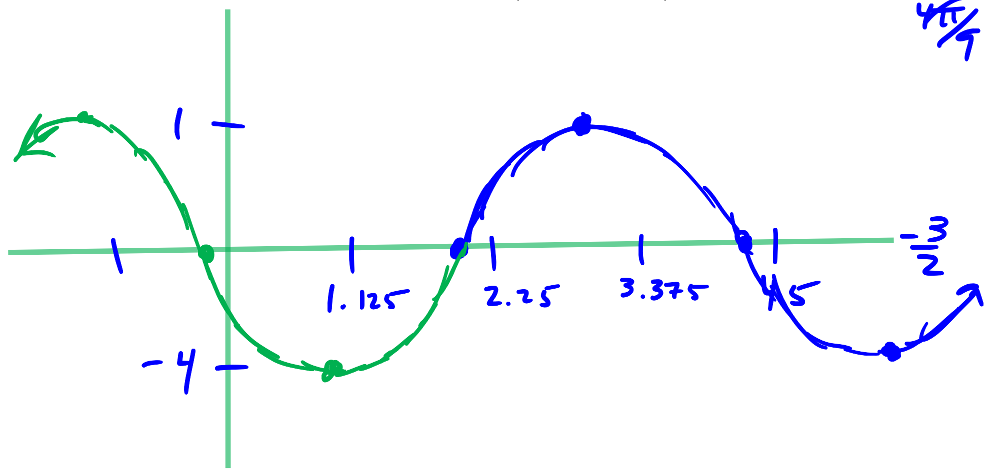
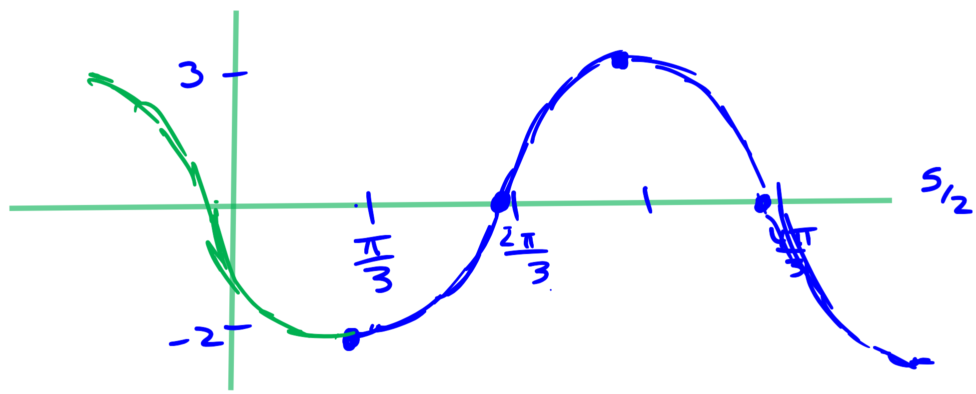
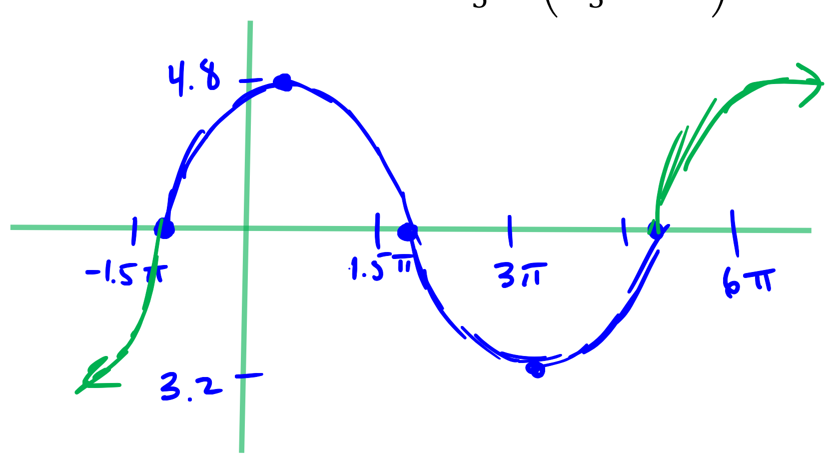
5.

$y = -\frac{1}{2}\sin\left(\frac{1}{3}(x+4\pi)\right)$

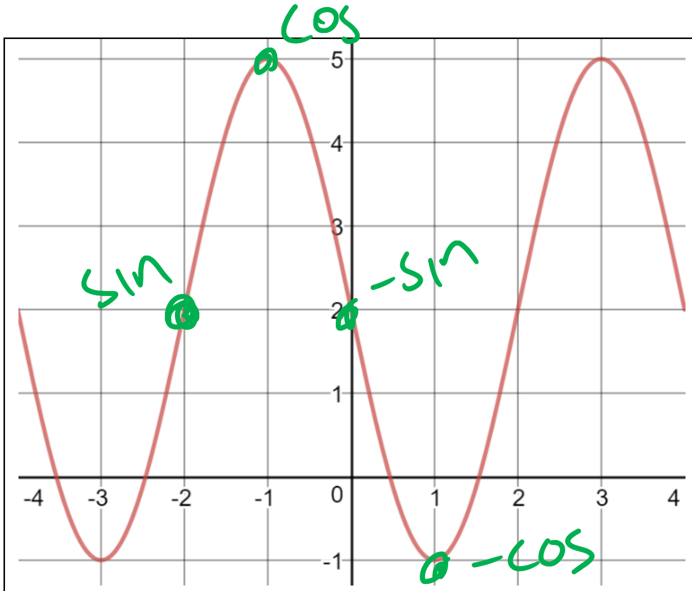
$T = \frac{2\pi}{1/3} = 6\pi$



6.	$y=\frac{1}{3}\cos\left(-\frac{\pi}{3}(x-1)\right)+2$ $=\frac{1}{3}\cos\left(\frac{\pi}{3}(x-1)\right)+2$ $T=\frac{2\pi}{\pi/3}=6$ 
7.	$y=5\cos\left(\frac{1}{6}(x-\pi)\right)-3$ $T=\frac{2\pi}{1/6}=12\pi$ 
8.	$y=-4\sin\left(\frac{2\pi}{3}(x+2)\right)-2$ $T=\frac{2\pi}{2\pi/3}=3$ 

9.	$y = \frac{5}{2}\sin\left(\frac{4\pi}{9}(x-2)\right) - \frac{3}{2}$ $T = \frac{2\pi}{4\pi/9} = 4.5$ 
10.	$y = -\frac{1}{2}\cos\left(\frac{3}{2}(x-1)\right) + \frac{5}{2}$ $T = \frac{2\pi}{3/2} = \frac{4\pi}{3}$ 
11.	$y = +\frac{4}{5}\sin\left(+\frac{1}{3}(x+4)\right) + 4$ $T = \frac{2\pi}{1/3} = 6\pi$ 

Identify the characteristics of the following graphs or description and build at least two equations (sine and cosine) that would have those characteristics.



$a = 3 = \frac{5+1}{2}$ $\quad d = 2 = \frac{5-1}{2}$

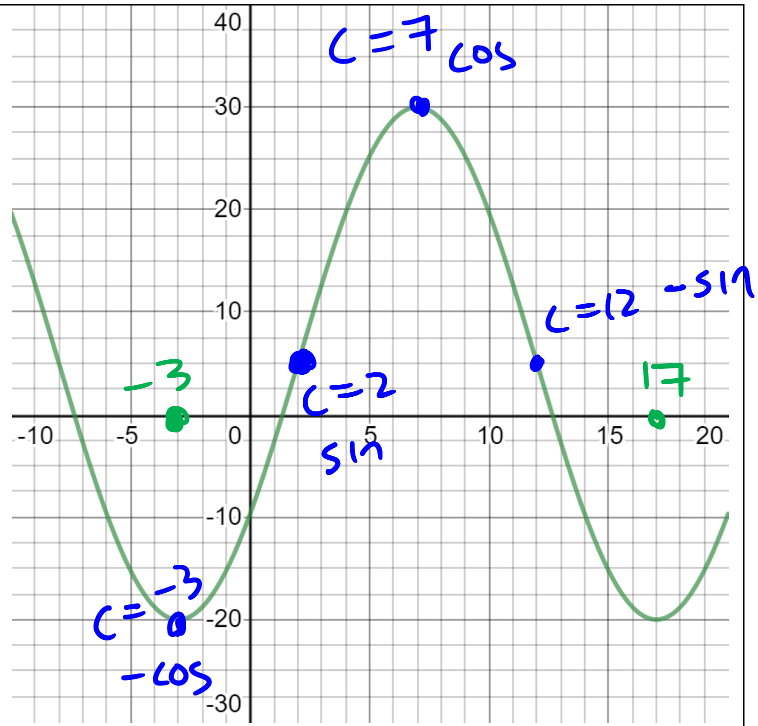
$T = 4 \Rightarrow b = \frac{\pi}{2}$

$y_1 = 3\cos\left(\frac{\pi}{2}(\theta+1)\right)+2$

$y_2 = 3\sin\left(\frac{\pi}{2}(\theta+2)\right)+2$

$y_3 = -3\sin\left(\frac{\pi}{2}(\theta+0)\right)+2$

$y_4 = -3\cos\left(\frac{\pi}{2}(\theta-1)\right)+2$



$a = \frac{30+20}{2} = 25$ $\quad T = 20$

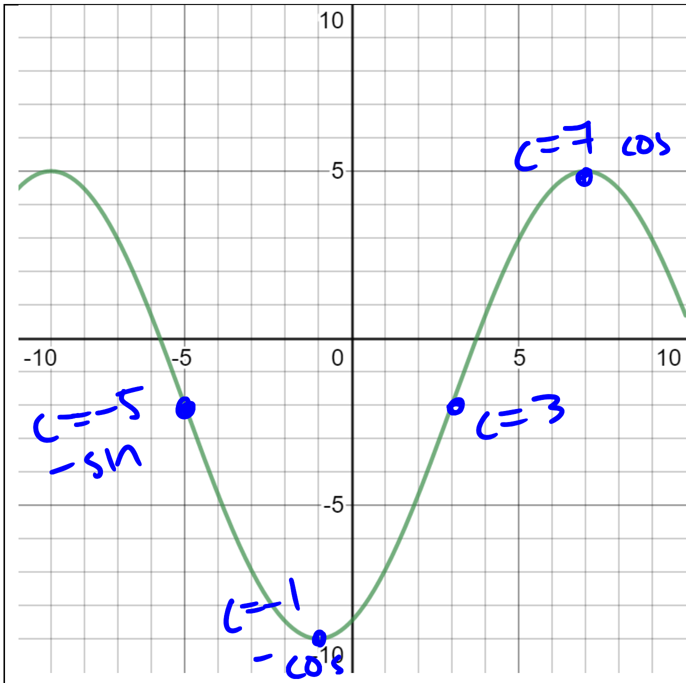
$d = \frac{30-20}{2} = 5$ $\quad b = \frac{\pi}{10}$

$y_1 = 25\cos\left(\frac{\pi}{10}(\theta-7)\right)+5$

$y_2 = -25\cos\left(\frac{\pi}{10}(\theta+3)\right)+5$

$y_3 = 25\sin\left(\frac{\pi}{10}(\theta-2)\right)+5$

$y_4 = -25\sin\left(\frac{\pi}{10}(\theta-12)\right)+5$



$a = \frac{5+9}{2} = 7$ $\quad d = \frac{5-9}{2} = -2$

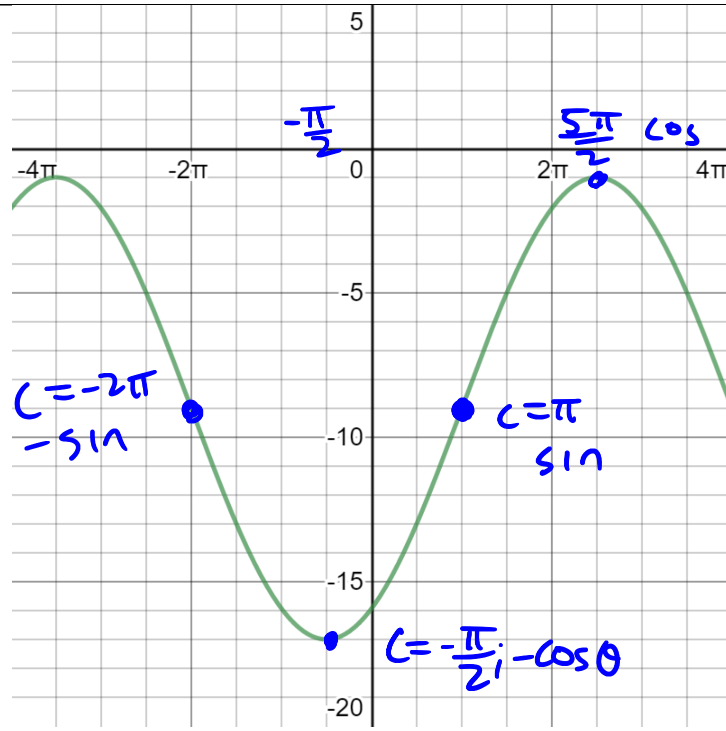
$T = 16;\ b = \frac{\pi}{8}$

$y_1 = 7\cos\left(\frac{\pi}{8}(\theta - 7)\right) - 2$

$y_2 = -7\cos\left(\frac{\pi}{8}(\theta + 1)\right) - 2$

$y_3 = 7\sin\left(\frac{\pi}{8}(\theta - 3)\right) - 2$

$y_4 = -7\sin\left(\frac{\pi}{8}(\theta + 5)\right) - 2$



$a = \frac{-1+17}{2} = 8$ $\quad T = 4\pi$

$b = \frac{1}{2}$

$d = \frac{-1-17}{2} = -9$

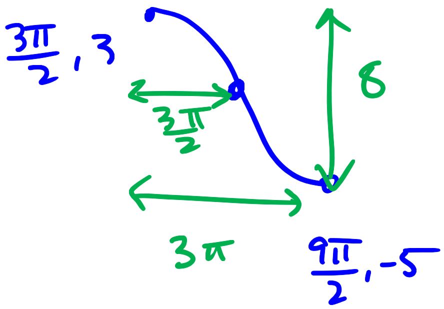
$y_1 = 8\cos\left(\frac{1}{2}\left(\theta - \frac{5\pi}{2}\right)\right) - 9$

$y_2 = -8\cos\left(\frac{1}{2}\left(\theta + \frac{\pi}{2}\right)\right) - 9$

$y_3 = 8\sin\left(\frac{1}{2}(\theta - \pi)\right) - 9$

$y_4 = -8\sin\left(\frac{1}{2}(\theta + 2\pi)\right) - 9$

There is a maximum at $\left(\frac{3\pi}{2}, 3\right)$ and the nearest minimum is at $\left(\frac{9\pi}{2}, -5\right)$.



$T = 6\pi$ $\quad b = \frac{1}{3}$

$a = 4$ $\quad d = -1$

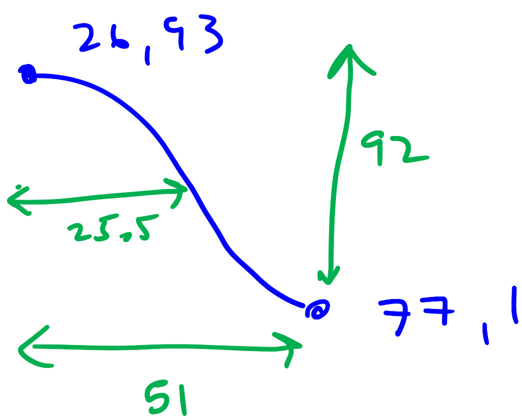
$y_1 = 4\cos\left(\frac{1}{3}\left(\theta - \frac{3\pi}{2}\right)\right) - 1$

$y_2 = -4\cos\left(\frac{1}{3}\left(\theta - \frac{9\pi}{2}\right)\right) - 1$

$y_3 = 4\sin\left(\frac{1}{3}\left(\theta - 0\right)\right) - 1$

$y_4 = -4\sin\left(\frac{1}{3}\left(\theta - 3\pi\right)\right) - 1$

There is a maximum at $(26, 93)$ and the nearest minimum is at $(77, 1)$.



$a = 46$ $\quad d = 47$

$T = 102$ $\quad b = \frac{\pi}{51}$

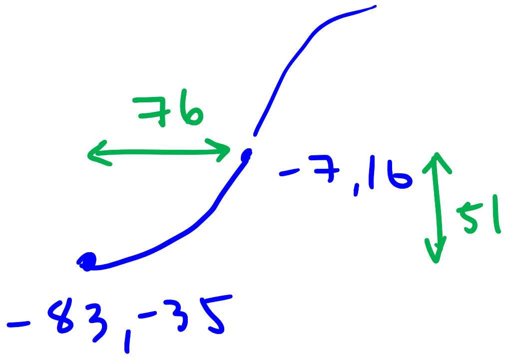
$y_1 = 46\cos\left(\frac{\pi}{51}\left(\theta - 26\right)\right) + 47$

$y_2 = -46\cos\left(\frac{\pi}{51}\left(\theta - 77\right)\right) + 47$

$y_3 = 46\sin\left(\frac{\pi}{51}\left(\theta - 0.5\right)\right) + 47$

$y_4 = -46\sin\left(\frac{\pi}{51}\left(\theta - 51.5\right)\right) + 47$

There is a minimum at $(-83, -35)$ and the function passes the midline next at $(-7,\ 16)$



$d = 16 \quad a = 51$

$T = 304 \quad b = \frac{\pi}{152}$

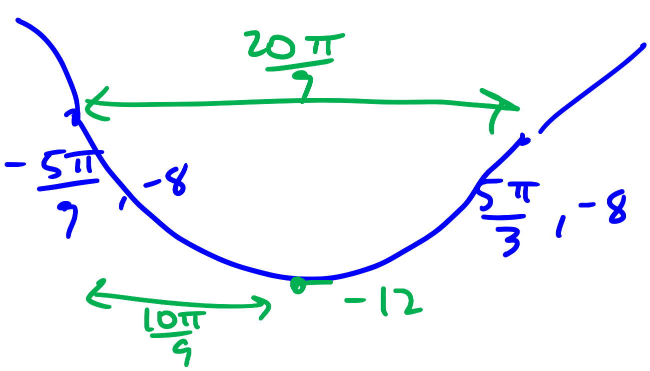
$$y_1 = 51\cos\left(\frac{\pi}{152}(\theta - 69)\right) + 16$$

$$y_2 = -51\cos\left(\frac{\pi}{152}(\theta + 83)\right) + 16$$

$$y_3 = 51\sin\left(\frac{\pi}{152}(\theta + 7)\right) + 16$$

$$y_4 = -51\sin\left(\frac{\pi}{152}(\theta - 145)\right) + 16$$

There are two consecutive intersections of the midline at $\left(-\frac{5\pi}{9}, -8\right)$ and $\left(\frac{5\pi}{3}, -8\right)$ and the function has a minimal vale of -12.



$d = -8$

$4 = a$

$T = \frac{40\pi}{9}$

$b = \frac{2\cancel{\pi}}{\frac{40\cancel{\pi}}{9}} = \frac{9}{20}$

$$y_1 = 4\cos\left(\frac{9}{20}\left(\theta + \frac{15\pi}{9}\right)\right) - 8$$

$$y_2 = -4\cos\left(\frac{9}{20}\left(\theta - \frac{5\pi}{9}\right)\right) - 8$$

$$y_3 = 4\sin\left(\frac{9}{20}\left(\theta - \frac{5\pi}{3}\right)\right) - 8$$

$$y_4 = -4\sin\left(\frac{9}{20}\left(\theta + \frac{5\pi}{9}\right)\right) - 8$$