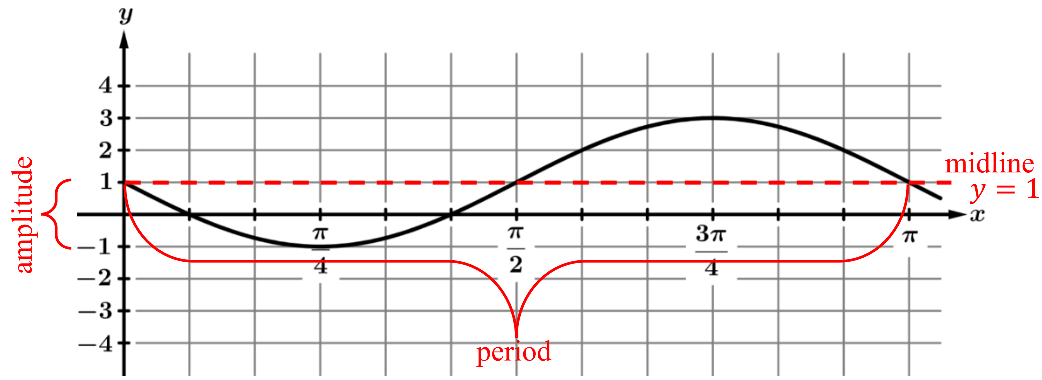
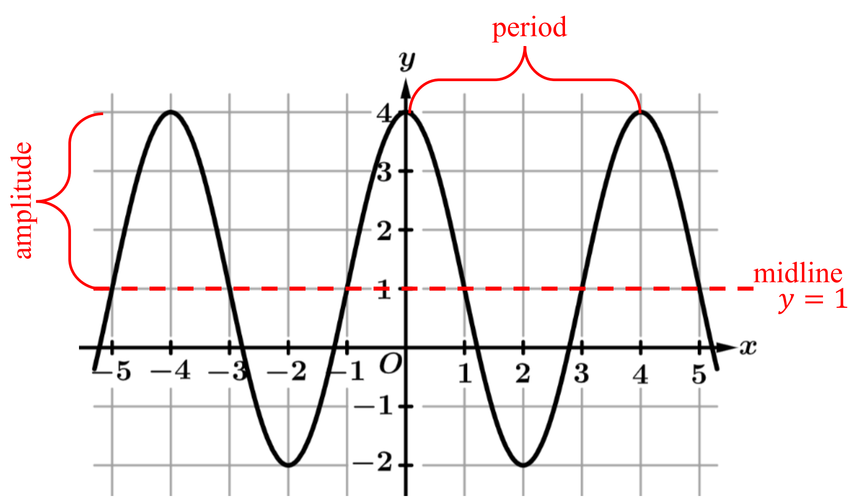


Graph of *h*

1. The graph of the sinusoidal function h is shown in the figure above. The function h can be written as $h(\theta)=a\sin(b\theta)+d$. Find the values of the constants a, b, and d.

$a=-2$ the amplitude and reflection over the midline. $\text{period}=\pi=\frac{2\pi}{b}\Rightarrow b=\frac{2\pi}{\pi}=2$

$d=1$ the vertical translation

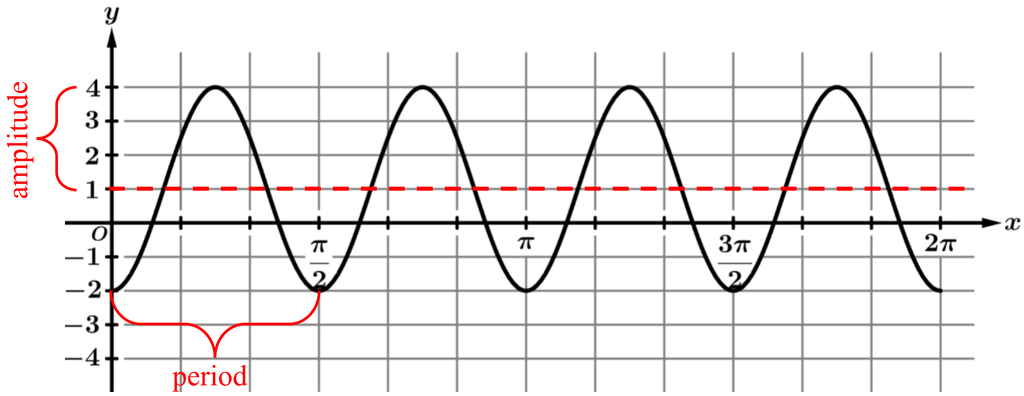


Graph of *f*

2. The graph of the sinusoidal function f is shown in the figure above. The function f can be written as $f(\theta)=a\cos(b\theta)+d$. Find the values of the constants a, b, and d.

$a=3$ the amplitude $\text{period}=4=\frac{2\pi}{b}\Rightarrow b=\frac{2\pi}{4}=\frac{\pi}{2}$ $d=1$ the vertical translation

Solutions by Ted Gott tedg20776@gmail.com



Graph of h

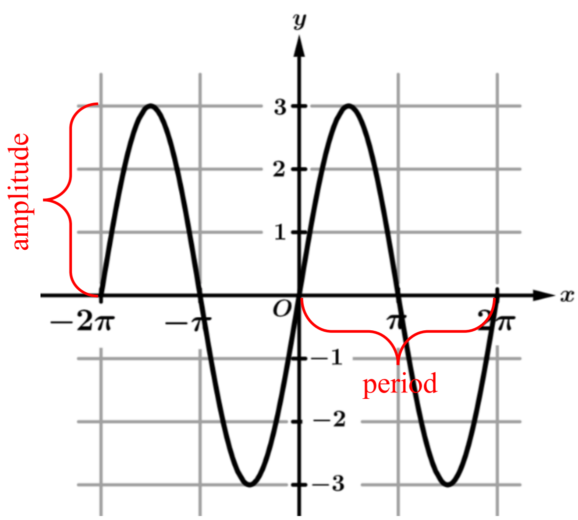
3. The figure shows the graph of a sinusoidal function h. What are the values of the period and amplitude of h?

(A) The period is π, and the amplitude is 3.

(B) The period is π, and the amplitude is 6.

(C) The period is $\frac{\pi}{2}$, and the amplitude is 3.

(D) The period is $\frac{\pi}{2}$, and the amplitude is 6.



Graph of h

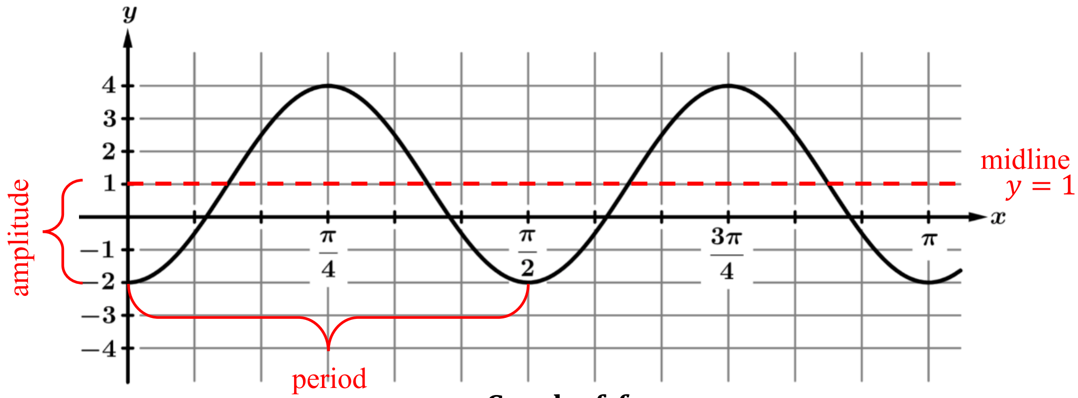
4. The figure shows the graph of a sinusoidal function h. What are the values of the period and amplitude of h?

(A) The period is π, and the amplitude is 3.

(B) The period is π, and the amplitude is 6.

(C) The period is 2π, and the amplitude is 3.

(D) The period is 2π, and the amplitude is 6.

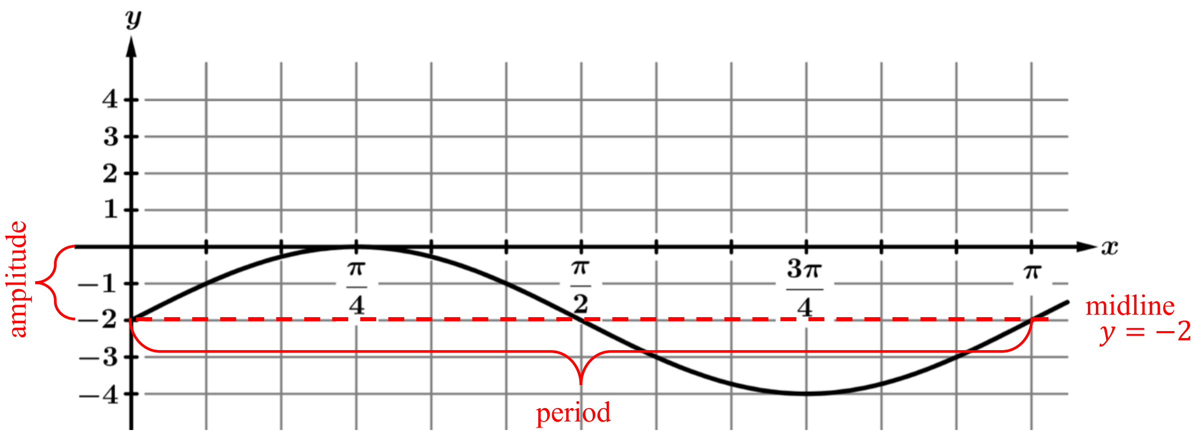


Graph of f

5. The figure shows the graph of a sinusoidal function f. Write an equation for f.

$a = 3$ the amplitude $\quad$ period $= \frac{\pi}{2} = \frac{2\pi}{b} \Rightarrow b = \frac{2\pi}{\frac{\pi}{2}} = 4$ $\quad$ $d = 1$ the vertical translation

The minimum is at $x = 0$, so this can be a cosine function reflected about the midline.
$f(x) = -3\cos(4x) + 1$



Graph of g

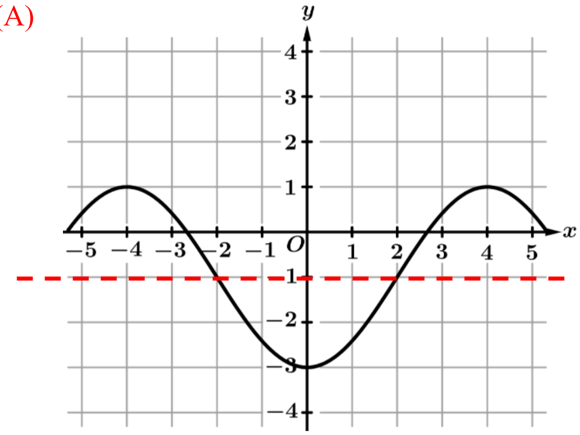
6. The figure shows the graph of a sinusoidal function g. Write an equation for g.

$a = 2$ the amplitude $\quad$ period $= \pi = \frac{2\pi}{b} \Rightarrow b = \frac{2\pi}{\pi} = 2$ $\quad$ $d = -2$ the vertical translation

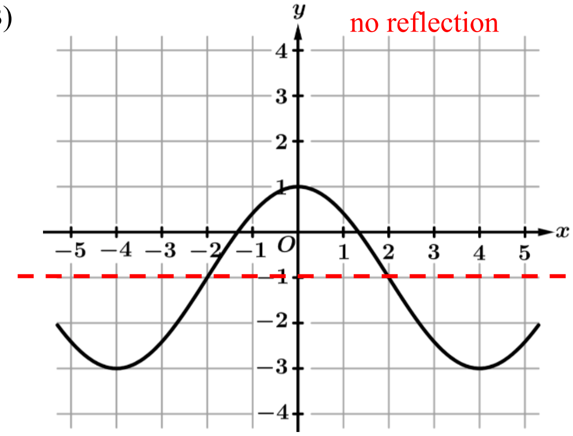
$g(x) = 2\sin(2x) - 2$

7. The function f is given by $f(x) = -2\cos\left(\frac{\pi}{4}x\right) - 1$. Which of the following could be the graph of $f(x)$?

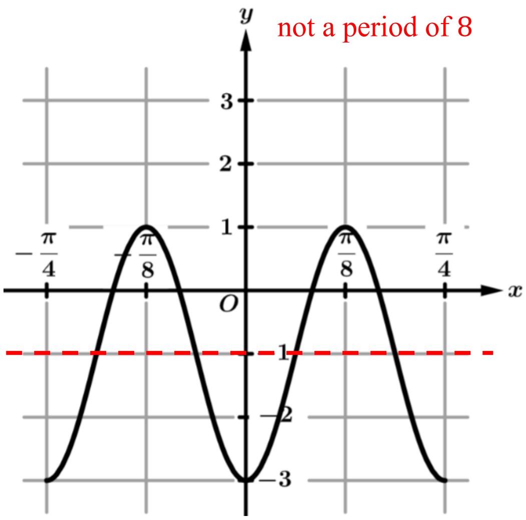
(A)



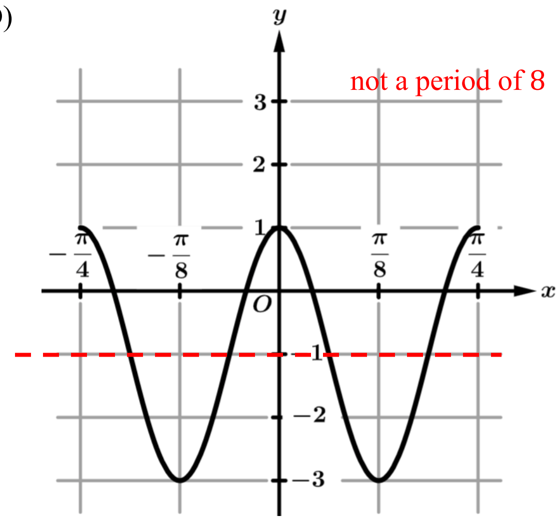
(B)



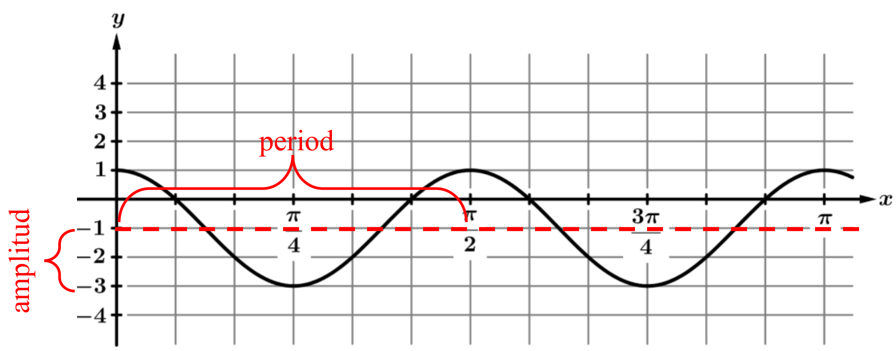
(C)



(D)



$a = -2$ the amplitude and reflection over $y = -1$ period $= \frac{2\pi}{b} = \frac{2\pi}{\frac{\pi}{4}} = 8$ $d = -1$ the midline



$a = 2$ the amplitude

period $= \frac{\pi}{2} = \frac{2\pi}{b}$

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

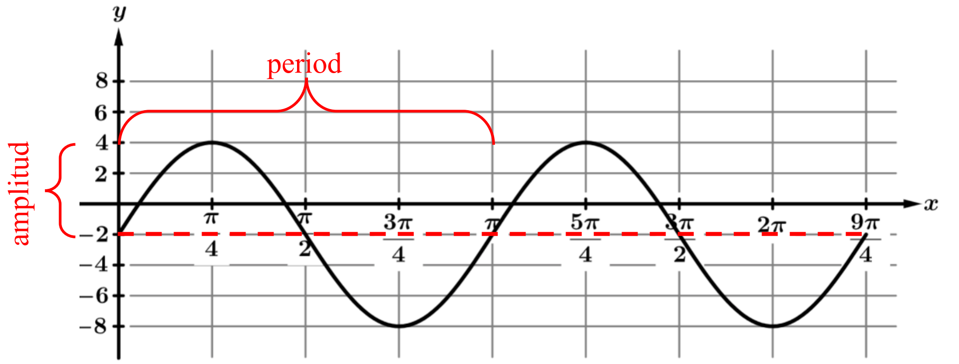
$d = -1$ the midline

Graph of g

8. The figure shows the graph of a trigonometric function g. Which of the following could be an expression for $g(x)$

(A) $2\sin(4x) - 1$ (B) $2\sin\left(4\left(x - \frac{\pi}{2}\right)\right) - 1$ (C) $2\cos\left(4\left(x - \frac{\pi}{4}\right)\right) - 1$ (D) $-2\cos\left(4\left(x - \frac{3\pi}{4}\right)\right) - 1$

$g(x) = 2\cos(4x) - 1$ is not a choice If $g(x)$ is shifted $\frac{\pi}{4}$ or $\frac{3\pi}{4}$ to the right there will need to be a reflection about the midline $y = -1$. This is choice (D).



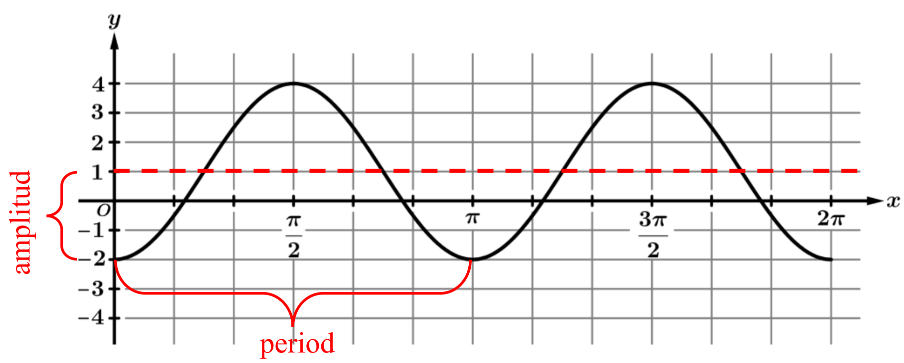
Graph of *f*

9. The figure shows the graph of a trigonometric function f. Which of the following could be an expression for $f(x)$

(A) $6\sin(2x)+2$ (B) $6\sin\left(2\left(x-\frac{\pi}{2}\right)\right)-2$ (C) $-6\sin\left(2\left(x-\frac{3\pi}{2}\right)\right)-2$ (D) $-6\sin(2(x-2\pi))-2$

$a = 6$ the amplitude period $= \pi = \frac{2\pi}{b} \Rightarrow b = \frac{2\pi}{\pi} = 2$ $d = -2$ the midline

$f(x) = 6\sin(2x) - 2$ is not a choice If $f(x)$ is shifted $\frac{3\pi}{2}$ to the right there will need to be a reflection about the the midline $y = -2$. This is choice (C).



Graph of *h*

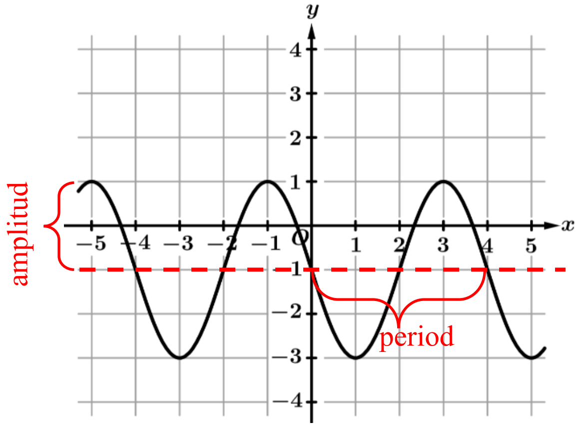
10. The figure shows the graph of a trigonometric function h. Which of the following could be an expression for $h(x)$

(A) $-3\cos(2x)-2$ (B) $3\cos\left(2\left(x-\frac{\pi}{2}\right)\right)+1$ (C) $3\sin\left(2\left(x-\frac{\pi}{2}\right)\right)+1$ (D) $-3\sin(2(x-\pi))+1$

$a = -3$ the amplitude with a reflection over $y = 1$ period $= \pi = \frac{2\pi}{b} \Rightarrow b = \frac{2\pi}{\pi} = 2$ $d = 1$ the midline

$h(x) = -3\cos(2x) + 1$ is not a choice

If $h(x)$ is shifted $\frac{\pi}{2}$ to the right there will no need for a reflection about the the midline $y = 1$. This is choice (B).



Graph of k

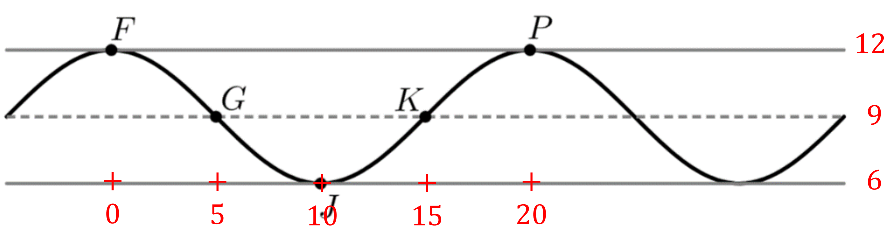
11. The figure shows the graph of a trigonometric function k. Which of the following could be an expression for $k(x)$

(A) $2\sin\left(\frac{\pi}{2}x\right)-1$ (B) $-2\sin\left(\frac{1}{4}x\right)-1$ (C) $2\sin\left(\frac{\pi}{2}(x-2)\right)-1$ (D) $-2\cos\left(\frac{\pi}{2}(x+1)\right)-1$

$a=-2$ the amplitude with a reflection over $y=-1$ period $=4=\frac{2\pi}{b} \Rightarrow b=\frac{2\pi}{4}=\frac{\pi}{2}$ $d=-1$ the midline

$k(x)=-2\sin\left(\frac{\pi}{2}x\right)-1$ is not a choice

If $k(x)$ is shifted 2 to the right there will no need for a reflection about the the midline $y=-1$. This is choice (C).



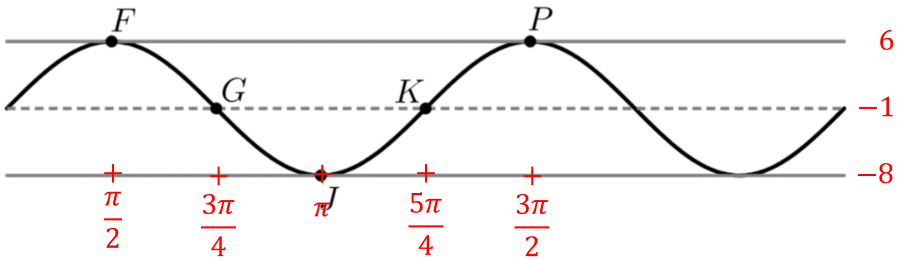
12. The graph of h and its dashed midline for two full cycles is shown. Five points, $F, G, J, K,$ and P are labeled on the graph. No scale is indicated, and no axes are presented.

The coordinates for the five points: $F, G, J, K,$ and P are: $F(0,12)$, $G(5,9)$, $J(10,6)$, $K(15,9)$, $P(20,12)$.

The function h can be written in the form $h(t)=a\sin(b(t+c))+d$. Find values of constants $a, b, c,$ and d.

There is one period from F to P, so the period is 20. The midline is $y=9$ and the amplitude is $12-(9)=3$. There is a horizontal shift because the sine function reaches its maximum at $t=\frac{\pi}{2}$, so the sine graph is shifted to the left 5.

$\frac{2\pi}{b}=20 \Rightarrow b=\frac{2\pi}{20}=\frac{\pi}{10}$ $a=3$ $d=9$ $\frac{\pi}{10}(0+c)=\frac{\pi}{2}$ $c=\frac{\pi}{2}\cdot\frac{10}{\pi}=5$ $h(t)=3\sin\left(\frac{\pi}{10}(t+5)\right)+9$



13. The graph of h and its dashed midline for two full cycles is shown. Five points, $F, G, J, K,$ and P are labeled on the graph. No scale is indicated, and no axes are presented.

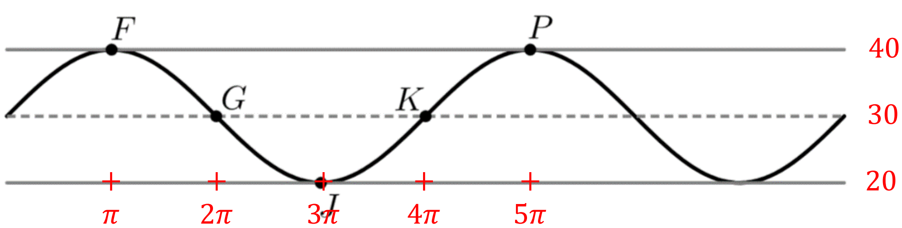
The coordinates of $F, G, J, K,$ and P are: $F\left(\frac{\pi}{2}, 6\right)$, $G\left(\frac{3\pi}{4}, -1\right)$, $J(\pi, -8)$, $K\left(\frac{5\pi}{4}, -1\right)$, $P\left(\frac{3\pi}{2}, 6\right)$.

The function h can be written in the form $h(t) = a\sin(b(t+c)) + d$. Find values of constants $a, b, c,$ and d.

There is one period from F to P, so the period is π. The midline is $y = -1$ and the amplitude is $6 - (-1) = 7$. There is a horizontal shift because the sine function reaches its maximum at $t = \frac{\pi}{2}$, so the sine graph is shifted to the right $\frac{\pi}{4}$.

$\frac{2\pi}{b} = \pi \Rightarrow b = \frac{2\pi}{\pi} = 2 \quad a = 7 \quad d = -1 \quad 2\left(\frac{\pi}{2} + c\right) = \frac{\pi}{2} \quad \left(\frac{\pi}{2} + c\right) = \frac{\pi}{4} \quad c = \frac{\pi}{4} - \frac{\pi}{2} = -\frac{\pi}{4}$

$h(t) = 7\sin\left(2\left(t - \frac{\pi}{4}\right)\right) - 1$



14. The graph of h and its dashed midline for two full cycles is shown. Five points, $F, G, J, K,$ and P are labeled on the graph. No scale is indicated, and no axes are presented.

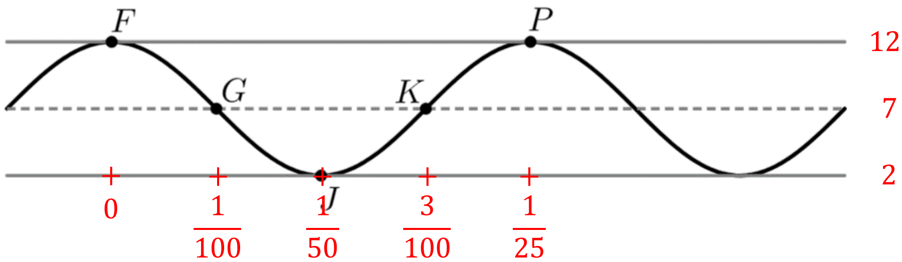
The coordinates for the points $F, G, J, K,$ and P are $F(\pi, 40)$, $G(2\pi, 30)$, $J(3\pi, 20)$, $K(4\pi, 30)$, $P(5\pi, 40)$.

The function h can be written in the form $h(t) = a\cos(b(t+c)) + d$. Find values of constants $a, b, c,$ and d.

There is one period from F to P, so the period is 4π. The midline is $y = 30$ and the amplitude is $40 - 30 = 10$. There is a horizontal shift because the cosine function reaches its maximum at $t = 0$, so the cosine graph is shifted to the right π.

$\frac{2\pi}{b} = 4\pi \Rightarrow b = \frac{2\pi}{4\pi} = \frac{1}{2} \quad a = 10 \quad d = 30 \quad \frac{1}{2}(\pi + c) = 0 \quad c = -\pi$

$h(t) = 10\cos\left(\frac{1}{2}(t - \pi)\right) + 30$



15. The graph of h and its dashed midline for two full cycles is shown. Five points, $F, G, J, K,$ and P are labeled on the graph. No scale is indicated, and no axes are presented.

The coordinates of $F, G, J, K,$ and P are $F(0,12)$, $G\left(\frac{1}{100},7\right)$, $J\left(\frac{1}{50},2\right)$, $K\left(\frac{3}{100},7\right)$, $P\left(\frac{1}{25},12\right)$.

The function h can be written in the form $h(t)=a\cos(b(t+c))+d$. Find values of constants $a, b, c,$ and d.

There is one period from F to P, so the period is $\frac{1}{25}$. The midline is $y = 7$ and the amplitude is $12 - 7 = 5$. There is a horizontal shift because the cosine function reaches its maximum at $t = 0$, so the cosine graph is shifted to the right $\frac{\pi}{4}$.

$\frac{2\pi}{b} = \frac{1}{25} \Rightarrow b = 50\pi \qquad a = 5 \qquad d = 7 \qquad 50\pi(0 + c) = 0 \qquad c = 0$

$h(t) = 5\cos\big(50\pi(t)\big) + 7$