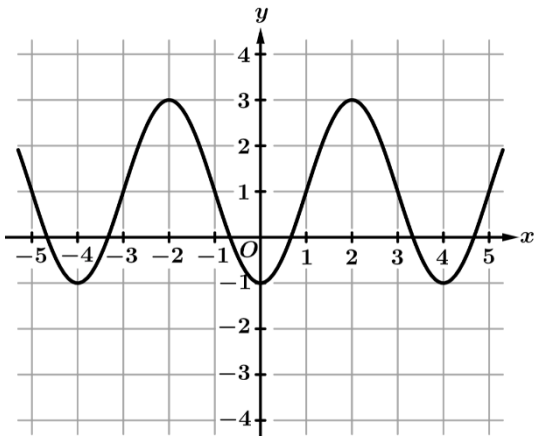
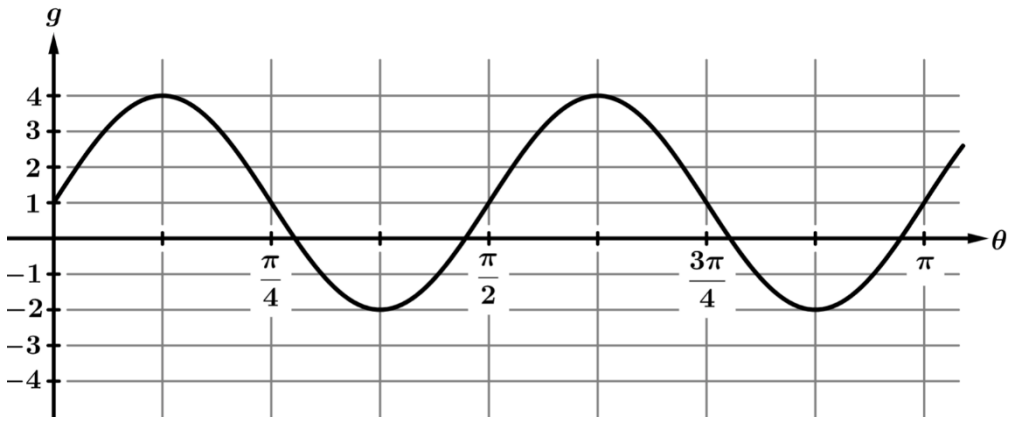


Graph of f

1. The sinusoidal function $f(x)$ is shown in the figure above. Find the period, frequency, amplitude, and midline for the graph of $f(x)$.

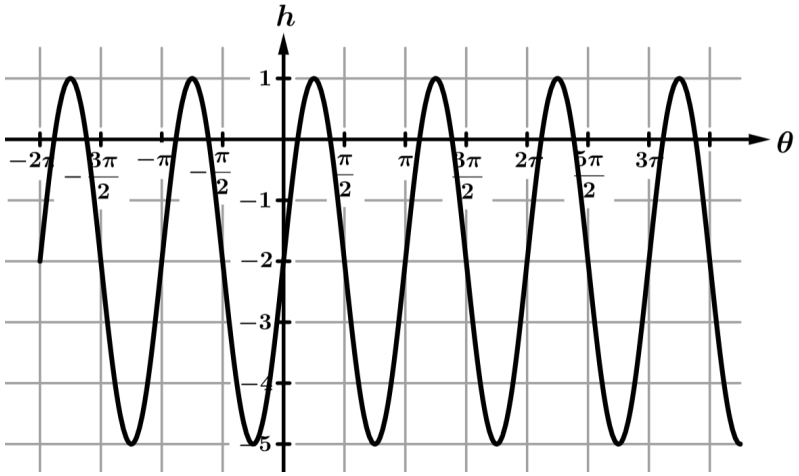
Period:	**Frequency:**	**Midline:**	**Amplitude:**
4	$\frac{1}{4}$	$y = \frac{3+(-1)}{2} = 1$	$3-(1) = 2$



Graph of g

2. The sinusoidal function $g(\theta)$ is shown in the figure above. Find the period, frequency, amplitude, and midline for the graph of $g(\theta)$.

Period:	**Frequency:**	**Midline:**	**Amplitude:**
$\frac{\pi}{2}$	$\frac{2}{\pi}$	$y = \frac{4+(-2)}{2} = 1$	$4-(1) = 3$



Graph of h

3. The sinusoidal function $h(\theta)$ is shown in the figure above. Find the period, frequency, amplitude, and midline for the graph of $h(\theta)$.

Period:	**Frequency:**	**Midline:**	**Amplitude:**
π	$\frac{1}{\pi}$	$y = \frac{1+(-5)}{2} = -2$	$1-(-2) = 3$

4. The sinusoidal function $g(\theta)$ has a maximum at the point $(0,\ 24)$. The first minimum after reaching this maximum value occurs at the point $(3\pi, 10)$. Find the period, frequency, amplitude, and midline for the graph of $g(\theta)$.

Period:	**Frequency:**	**Midline:**	**Amplitude:**
$\underbrace{3\pi - 0 = 3\pi}_{\frac{1}{2}\text{ period}} \Rightarrow 6\pi$	$\frac{1}{6\pi}$	$y = \frac{24+(10)}{2} = 17$	$24-17 = 7$

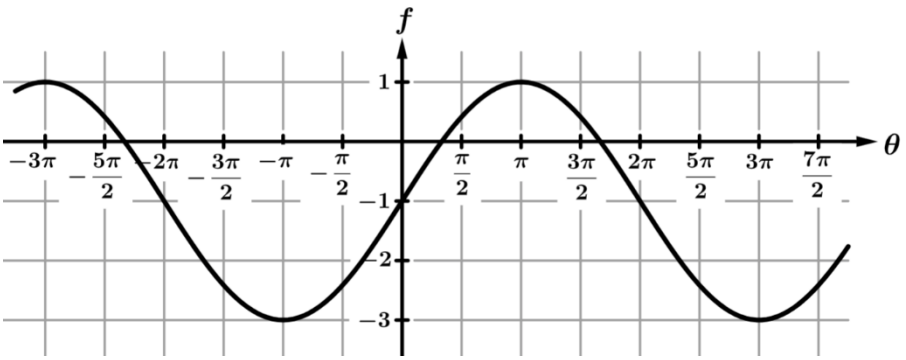
5. The sinusoidal function $h(\theta)$ has a minimum at the point $\left(\frac{\pi}{4}, 6\right)$. The first maximum after reaching this minimum value occurs at the point $\left(\frac{5\pi}{4}, 16\right)$. Find the period, frequency, amplitude, and midline for the graph of $h(\theta)$.

Period:	**Frequency:**	**Midline:**	**Amplitude:**
$\underbrace{\frac{5\pi}{4} - \frac{\pi}{4} = \pi}_{\frac{1}{2}\text{ period}} \Rightarrow 2\pi$	$\frac{1}{2\pi}$	$y = \frac{16+(6)}{2} = 11$	$16-11 = 5$

6. The sinusoidal function $k(\theta)$ has a minimum at the point $\left(-\frac{\pi}{2}, -4\right)$. The first maximum after reaching this minimum value occurs at the point $(0, 8)$. Find the period, frequency, amplitude, and midline for the graph of $k(\theta)$.

Period:	**Frequency:**	**Midline:**	**Amplitude:**
$\underbrace{0 - \frac{-\pi}{2} = \frac{\pi}{2}}_{\frac{1}{2}\text{ period}} \Rightarrow \pi$	$\frac{1}{\pi}$	$y = \frac{8+(-4)}{2} = 2$	$8-2 = 6$

Directions: Use the graph of the sinusoidal function $f(\theta)$ to answer problems 7 – 10.



Graph of f

7. Which of the following best describes the behavior of f over the interval $0 < \theta < \pi$?

(A) f is increasing at an increasing rate.

(B) f is increasing at a decreasing rate. Increasing and concave down

(C) f is decreasing at an increasing rate.

(D) f is decreasing at a decreasing rate.

8. Which of the following best describes the behavior of f over the interval $-2\pi < \theta < -\pi$?

(A) f is increasing and the graph of f is concave up.

(B) f is increasing and the graph of f is concave down.

(C) f is decreasing and the graph of f is concave up.

(D) f is decreasing and the graph of f is concave down.

9. Which of the following best describes the behavior of f over the interval $2\pi < \theta < 3\pi$?

(A) f is positive and increasing.

(B) f is positive and decreasing.

(C) f is negative and increasing.

(D) f is negative and decreasing.

10. Which of the following best describes the rate of change of f over the interval $-\pi < \theta < 0$?

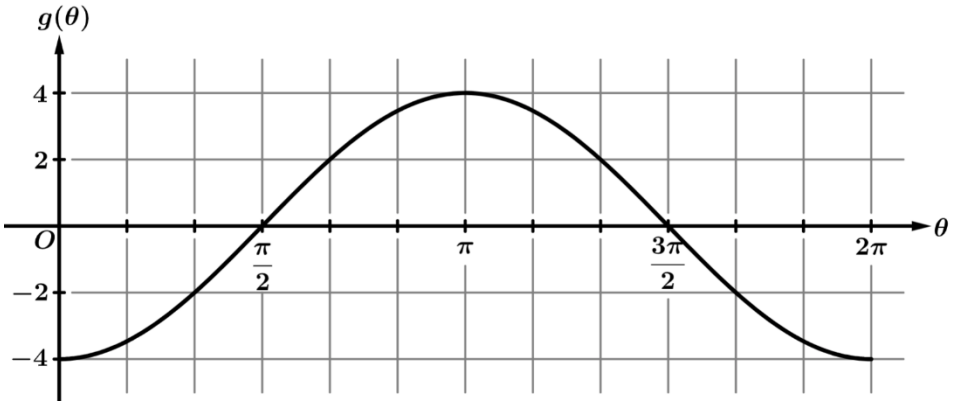
(A) The rate of change of f is positive and increasing. f is concave up and is increasing.

(B) The rate of change of f is positive and decreasing.

(C) The rate of change of f is negative and increasing.

(D) The rate of change of f is negative and decreasing.

Directions: Use the graph of the sinusoidal function $g(\theta)$ to answer problems 11 – 14.



Graph of g

11. Which of the following best describes the behavior of g over the interval $0 < \theta < \frac{\pi}{2}$?

(A) g is positive and increasing.

(B) g is positive and decreasing.

(C) g is negative and increasing.

(D) g is negative and decreasing.

12. Which of the following best describes the behavior of g over the interval $\frac{\pi}{2} < \theta < \pi$?

(A) g is increasing at an increasing rate.

(B) g is increasing at a decreasing rate. g is concave down

(C) g is decreasing at an increasing rate.

(D) g is decreasing at a decreasing rate.

13. Which of the following best describes the rate of change of g over the interval $\pi < \theta < \frac{3\pi}{2}$?

(A) The rate of change of g is positive and increasing.

(B) The rate of change of g is positive and decreasing.

(C) The rate of change of g is negative and increasing.

(D) The rate of change of g is negative and decreasing. g is decreasing and concave down.

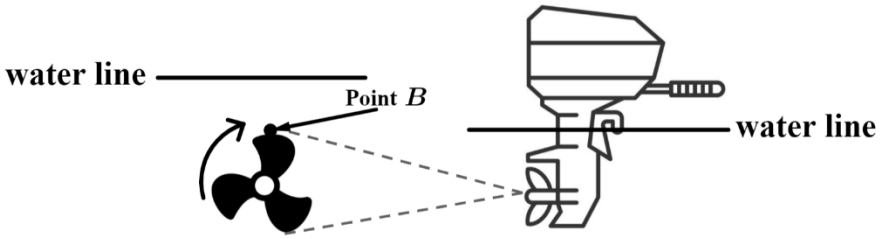
14. Which of the following best describes the behavior of g over the interval $\frac{3\pi}{2} < \theta < 2\pi$?

(A) g is increasing and the graph of g is concave up.

(B) g is increasing and the graph of g is concave down.

(C) g is decreasing and the graph of g is concave up.

(D) g is decreasing and the graph of g is concave down.



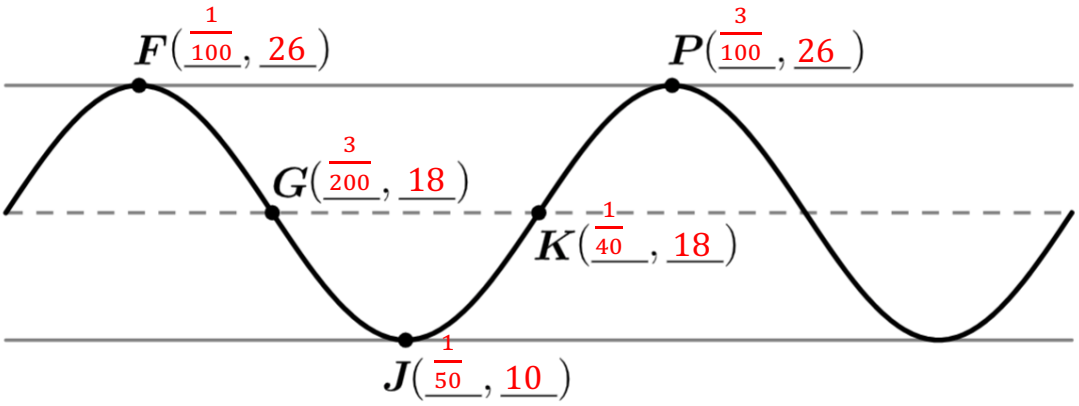
Note: Figure NOT drawn to scale

15. The blades of a boat motor rotate in a clockwise direction and complete 50 rotations every second. Point B is on the tip of one of the blades and is located directly above the center of the motor at time $t = 0$ seconds, as indicated in the figure. Point B is 8 inches from the center of the motor. The center of the motor is 18 inches below the water line. As the blades of the motor rotate at a constant speed, the distance between B and the water line periodically increases and decreases.

The sinusoidal function h models the distance between point B and the water line, in inches, as a function of time t in seconds.

(A) 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.

Determine possible coordinates $(t, h(t))$ for the five points: $F, G, J, K,$ and P.



$\frac{1}{4} \cdot \frac{1}{50} = \frac{1}{200}$

$\frac{1}{100} = \frac{2}{200}$

$\frac{1}{50} = \frac{4}{200}$

$\frac{1}{40} = \frac{5}{200}$

$\frac{3}{100} = \frac{6}{200}$

$\frac{1}{25} = \frac{8}{200}$

At time $t = 0$ seconds, point B is at the highest spot on the blade and 10 inches from the water line, so one rotation later, at $t = \frac{1}{50} = 0.02$ seconds, the point B is 10 inches from the water line.

(B) Find the period, frequency, amplitude, and midline for the graph of h.

Period:	**Frequency:**	**Midline:**	**Amplitude:**
$\frac{1}{50}$	50	$y = 18$	8

(C) Find two intervals for which the graph of h is both decreasing and concave up.

h is both decreasing and concave up on the intervals $\left(\frac{3}{200}, \frac{1}{50}\right)$ and $\underbrace{\left(\frac{3}{200} + \frac{1}{50}, \frac{1}{50} + \frac{1}{50}\right)}_{\text{1 period}} = \left(\frac{7}{200}, \frac{1}{25}\right)$