



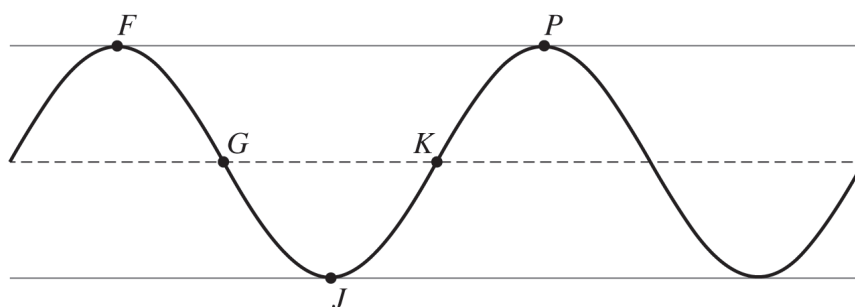
Note: Figure not drawn to scale.

3. The tire of a car has a radius of 9 inches, and a person rolls the tire forward at a constant rate on level ground, as shown in the figure. Point W on the edge of the tire touches the ground at time $t = \frac{1}{2}$ second. The tire completes a full rotation, and the next time W touches the ground is at time $t = \frac{5}{2}$ seconds. The maximum height of W above the ground is 18 inches. As the tire rolls, the height of W above the ground periodically increases and decreases.

The sinusoidal function h models the height of point W above the ground, 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 .



- (B) 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 .
- (C) Refer to the graph of h in part (A). The t -coordinate of K is t_1 , and the t -coordinate of P is t_2 .
- On the interval (t_1, t_2) , which of the following is true about h ?
 - h is positive and increasing.
 - h is positive and decreasing.
 - h is negative and increasing.
 - h is negative and decreasing.
 - Describe how the rate of change of h is changing on the interval (t_1, t_2) .

Write your responses to this question only on the designated pages in the separate Free Response booklet. Write your solution to each part in the space provided for that part.