

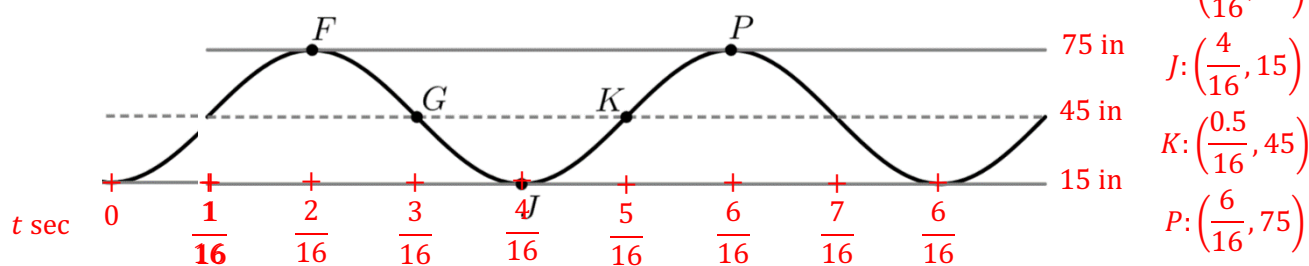
**Note: Figure NOT drawn to scale**

1. A prize wheel used for a game show has an electronic motor that allows a circular wheel to spin at a constant speed in the clockwise direction until a contestant presses the stop button (not shown). The center of the wheel is 30 inches away from point A. At time  $t = 0$  seconds, point A is at the lowest spot on the wheel, and the distance between point A and a level table is 15 inches, as shown in the figure. The wheel completes 4 full rotations every second. As the wheel spins, the distance between point A and the level table periodically increases and decreases.

The periodic function  $d$  models the distance, in inches, between point A and the level table as a function of time  $t$  in seconds.

(A) The graph of  $d$  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  $(t, d(t))$  for the five points:  $F$ ,  $G$ ,  $J$ ,  $K$ , and  $P$ .



At time  $t = 0$  seconds, point A is at the lowest spot on the wheel and 15 inches from the table, so one rotation later, at  $t = 0.25$ , the distance between point A and the table is 15 inches.

(B) Refer to the graph of  $d$  in part (A). The  $t$ -coordinate of  $J$  is  $t_1$ , and the  $t$ -coordinate of  $K$  is  $t_2$ .

(j) On the interval  $(t_1, t_2)$ , which of the following is true about  $d$ ?

- a.  $d$  is positive and increasing.
- b.  $d$  is positive and decreasing.
- c.  $d$  is negative and increasing.
- d.  $d$  is negative and decreasing.

(ii) On the interval  $(t_1, t_2)$ . Describe the concavity of the graph of  $d$  and determine whether the rate of change of  $d$  is increasing or decreasing.

The rate of change of  $d$  is increasing because the graph of  $d$  is concave up on the interval  $(t_1, t_2)$