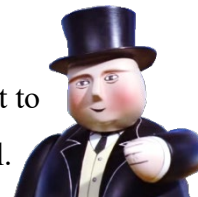


Thomas the Tank Engine Takes a Trip



Thomas the Tank Engine is $d = f(t)$ miles from his boss Sir Topham Hatt, where t is given in hours. The graph of $d = f(t)$ is given below for $0 \leq t \leq 7$. Sketch a line segment to represent the average rate of change $\frac{\Delta d}{\Delta t}$ of $f(t)$ on the graph of $d = f(t)$ for each interval.

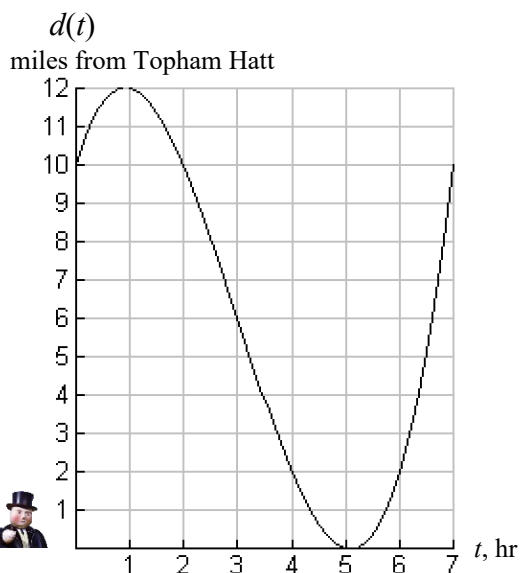


Interpret what the average rate of change means to Thomas the Tank Engine.

1. From $t = 3$ to $t = 7$: $\Delta d = \underline{\hspace{2cm}}$, $\Delta t = \underline{\hspace{2cm}}$

a. The average rate of change from $t = 3$ to $t = 7$ is $\frac{\Delta d}{\Delta t} = \boxed{\hspace{2cm}}$ $\xrightarrow{\hspace{2cm}}$ *Report units of measure*

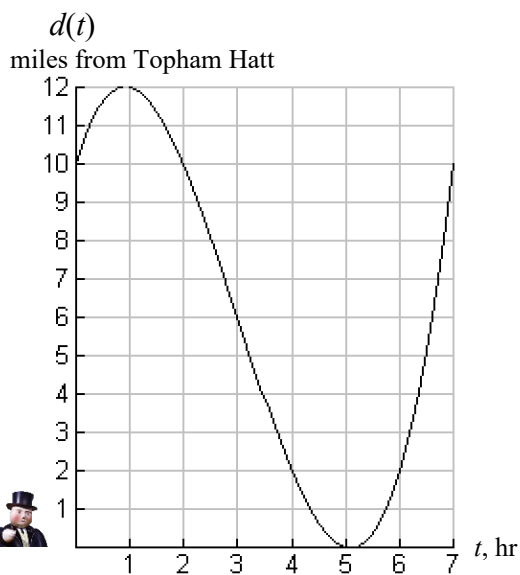
b. Interpret the meaning of $\frac{\Delta d}{\Delta t}$ in terms of his trip.



2. From $t = 0$ to $t = 7$: $\Delta d = \underline{\hspace{2cm}}$, $\Delta t = \underline{\hspace{2cm}}$

a. The average rate of change from $t = 0$ to $t = 7$ is $\frac{\Delta d}{\Delta t} = \boxed{\hspace{2cm}}$ $\xrightarrow{\hspace{2cm}}$ *Report units of measure*

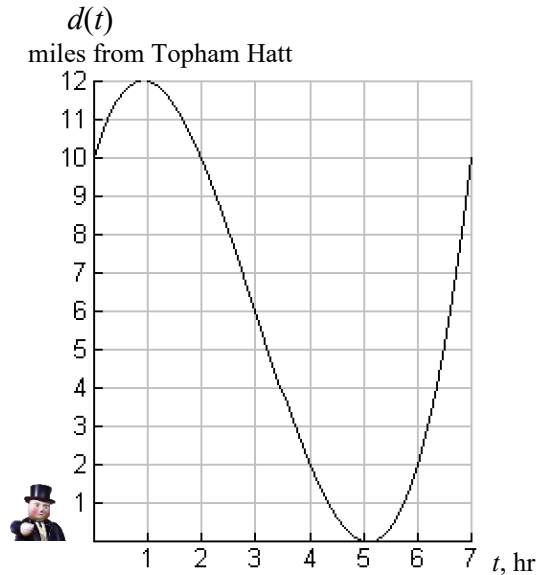
b. Interpret the meaning of $\frac{\Delta d}{\Delta t}$ in terms of his trip.



3. From $t = 3$ to $t = 5$: $\Delta d = \underline{\hspace{2cm}}$, $\Delta t = \underline{\hspace{2cm}}$

a. The average rate of change from $t = 3$ to $t = 4$ is $\frac{\Delta d}{\Delta t} = \boxed{\hspace{2cm}}$ $\xrightarrow{\hspace{2cm}}$ *Report units of measure*

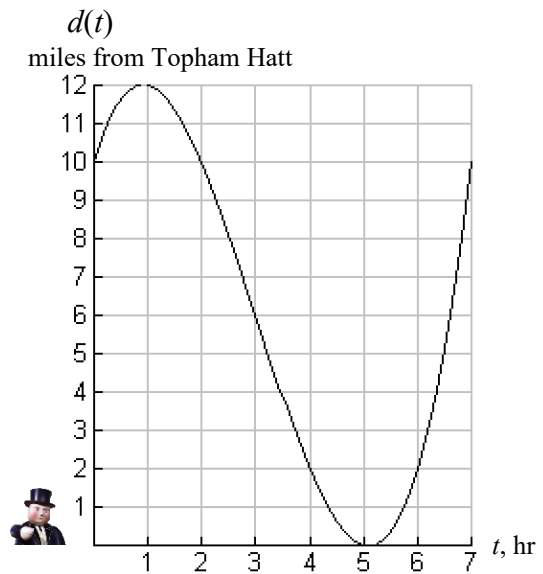
b. Interpret the meaning of $\frac{\Delta d}{\Delta t}$ in terms of his trip.



4. From $t = 3$ to $t = 4$: $\Delta d = \underline{\hspace{2cm}}$, $\Delta t = \underline{\hspace{2cm}}$

a. The average rate of change from $t = 3$ to $t = 4$ is $\frac{\Delta d}{\Delta t} = \boxed{\hspace{2cm}}$ $\xrightarrow{\hspace{2cm}}$ *Report units of measure*

b. Interpret the meaning of $\frac{\Delta d}{\Delta t}$ in terms of his trip.



5. On the interval for $0 \leq t \leq 7$, use the graph to answer the following questions. Enter whole numbers in the blanks.

- When traveling **toward** Sir Topham Hatt, Thomas is speediest at time $t = \underline{\hspace{2cm}}$ hr where Thomas is at the mile marker $\underline{\hspace{2cm}}$ miles.
- When traveling **away** from Sir Topham Hatt, Thomas is speediest at time $t = \underline{\hspace{2cm}}$ hr where Thomas is at the mile marker $\underline{\hspace{2cm}}$ miles.
- Thomas is traveling the slowest at $t = \underline{\hspace{2cm}}$ hr where he is at mile marker(s) $\underline{\hspace{2cm}}$ miles.
- Suppose right before the 7 hour mark a car stalls on the tracks at mile marker 10 when $t = 7$. Approximate the speed at the instant Thomas hits the car. $\underline{\hspace{2cm}}$ mph
We call this speed the **instantaneous rate of change** or **instantaneous velocity** at $t = 7$.

