

Name Solutions  
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Math 2250-1  
Quiz 1  
August 24, 2012

1) Consider a car driving along a marked road for a three minute test run. The car begins at location  $x_0 = 0$  miles, at  $t = 0$  minutes. The car's velocity is recorded on the graph below.

1a) Use the graphical data for the velocity function to reconstruct a formula for the position function  $x(t)$  of the car,  $0 \leq t \leq 3$ .

(6 points)

from the graph

$$v(t) = \begin{cases} 2t & 0 \leq t \leq 1 \\ 2 & 1 \leq t \leq 3. \end{cases}$$

for  $0 \leq t \leq 1$ :

$$\begin{cases} x'(t) = 2t \\ x(0) = 0 \end{cases}$$

$$\Rightarrow x(t) = \int 2t dt = t^2 + C$$

$$x(0) = 0 \Rightarrow C = 0$$

$$\boxed{x(t) = t^2 \quad 0 \leq t \leq 1}$$

note  $x(1) = 1$

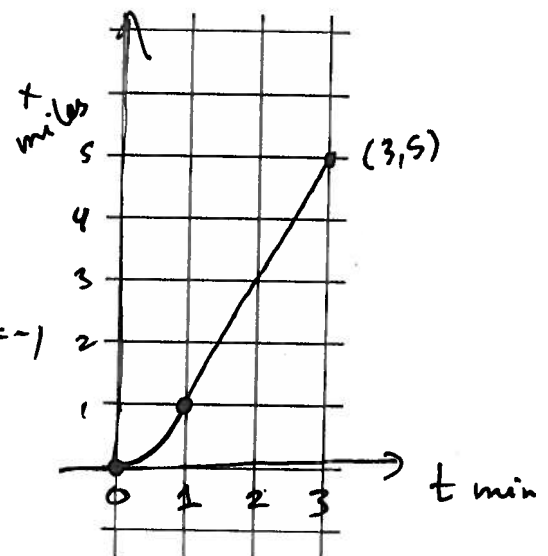
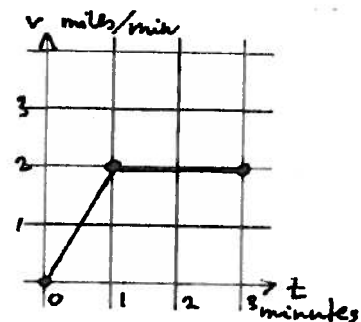
for  $1 \leq t \leq 3$

$$\begin{cases} x'(t) = 2 \\ x(1) = 1 \end{cases} \quad 1 \leq t \leq 3$$

$$\Rightarrow x(t) = \int 2 dt = 2t + C$$

$$x(1) = 1 \Rightarrow 1 = 2 + C \Rightarrow C = -1$$

$$\boxed{x(t) = 2t - 1 \quad 1 \leq t \leq 3}$$



1b) Sketch the graph of the position function  $x(t)$ , using the grid at the right, just below the velocity graph. Make sure to label your axes with appropriate units.

(3 points)

1c) How far did the car travel in those 3 minutes?

$$x(3) - x(0) = 5 \text{ miles}$$

(1 point)

(note this is also the area under the velocity curve, since  $x(3) - x(0) = \int_0^3 x'(t) dt = \text{area} = 5$ ).