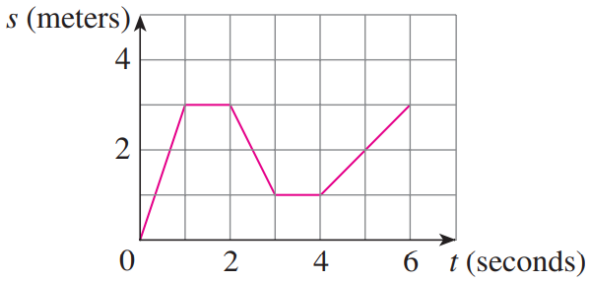
Exercise 11

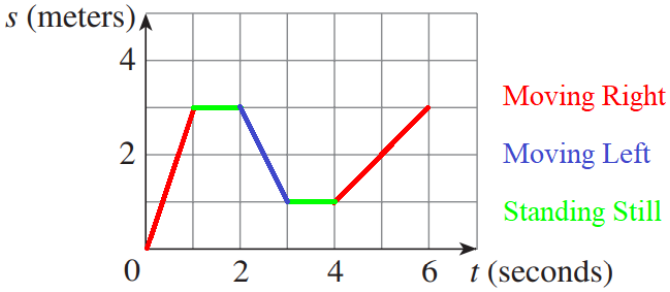
(a) A particle starts by moving to the right along a horizontal line; the graph of its position function is shown in the figure. When is the particle moving to the right? Moving to the left? Standing still?

(b) Draw a graph of the velocity function.



Solution

Part (a)



The particle is moving to the right for $t \in (0,1) \cup (4,6)$, the particle is moving to the left for $t \in (2,3)$, and the particle is standing still for $t \in (1,2) \cup (3,4)$.

Part (b)

The velocity function is the slope of the position function, which consists of straight lines on several intervals of t. For $0 < t < 1$, the rise is 3 and the run is 1, so the slope is

$$m = \frac{3}{1} = 3.$$

For $1 < t < 2$, the rise is 0 and the run is 1, so the slope is

$$m = \frac{0}{1} = 0.$$

For $2 < t < 3$, the rise is -2 and the run is 1, so the slope is

$$m = \frac{-2}{1} = -2.$$

For $3 < t < 4$, the rise is 0 and the run is 1, so the slope is

$$m = \frac{0}{1} = 0.$$

For $4 < t < 6$, the rise is 2 and the run is 2, so the slope is

$$m = \frac{2}{2} = 1.$$

Note that the slope is undefined where there are kinks in the position function, resulting in points of discontinuity in the velocity function.