

Playlist

Circulus – Velocity Races

Reverb – Velocity Fall

Thursday – At this Velocity

Temporary website with syllabus & HW at: evantilton.com/ph202af19



Day 3, August 30, 2019

PH 202A

Reminders about what's coming up.

- **For Monday:**
 - Read OpenStax College Physics Section 2.4
 - Complete Reading Survey by 8am
- HW#2 is due in one week

Don't wait to get help if you are getting lost or are having problems! Come talk to me!

Vectors

A vector is a quantity that has a *magnitude* and a *direction*.

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A vector is a quantity that has a *magnitude* and a *direction*.

We can describe a vector with components.

We'll often discuss the components of vectors

Components are like a set of instructions. For example,

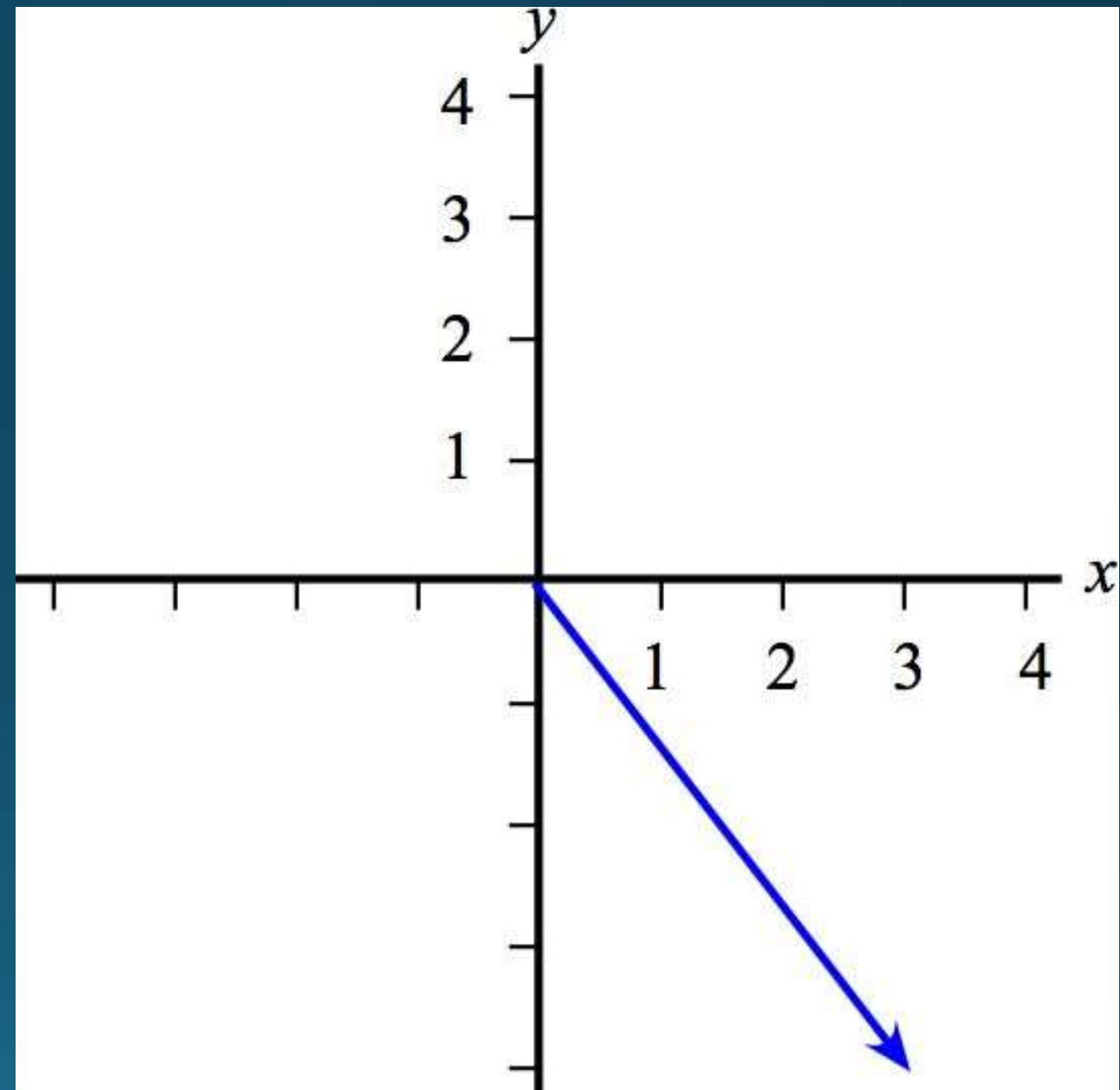
$$\vec{d} = \begin{bmatrix} 3 \text{ m} \\ 1 \text{ m} \\ 0 \end{bmatrix}$$

means that to get from the beginning to the end of the vector you must go 3 meters in the x-direction, 1 meter in the y-direction, and 0 meters in the z-direction.

Clicker question

What are the x and y components of the vector, which we'll call \vec{d} , in the figure?

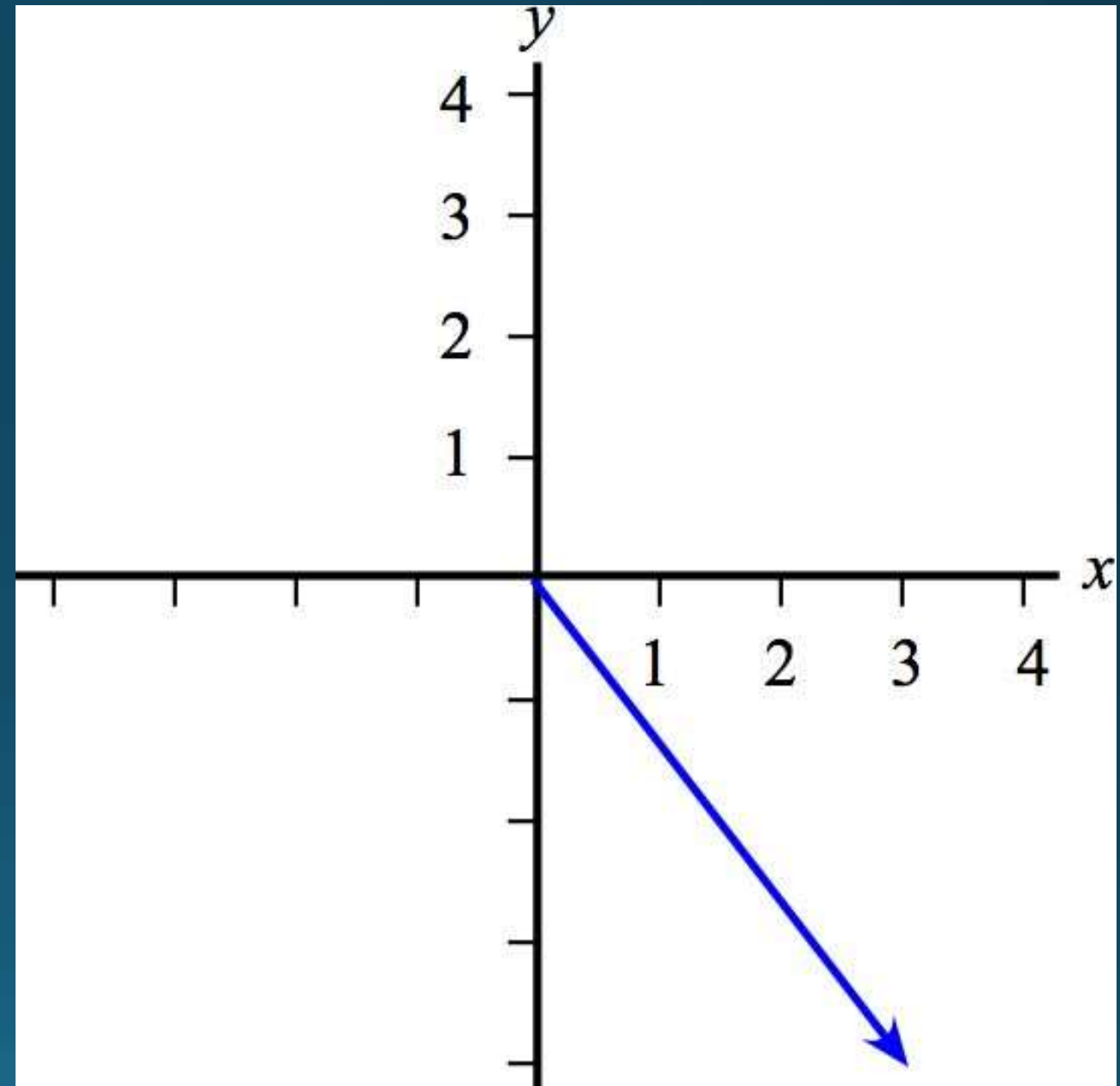
- A. $d_x = 3, d_y = -1$
- B. $d_x = 3, d_y = -4$
- C. $d_x = -3, d_y = 3$
- D. $d_x = 4, d_y = -3$



Clicker question

What are the x and y components of the vector, which we'll call \vec{d} , in the figure?

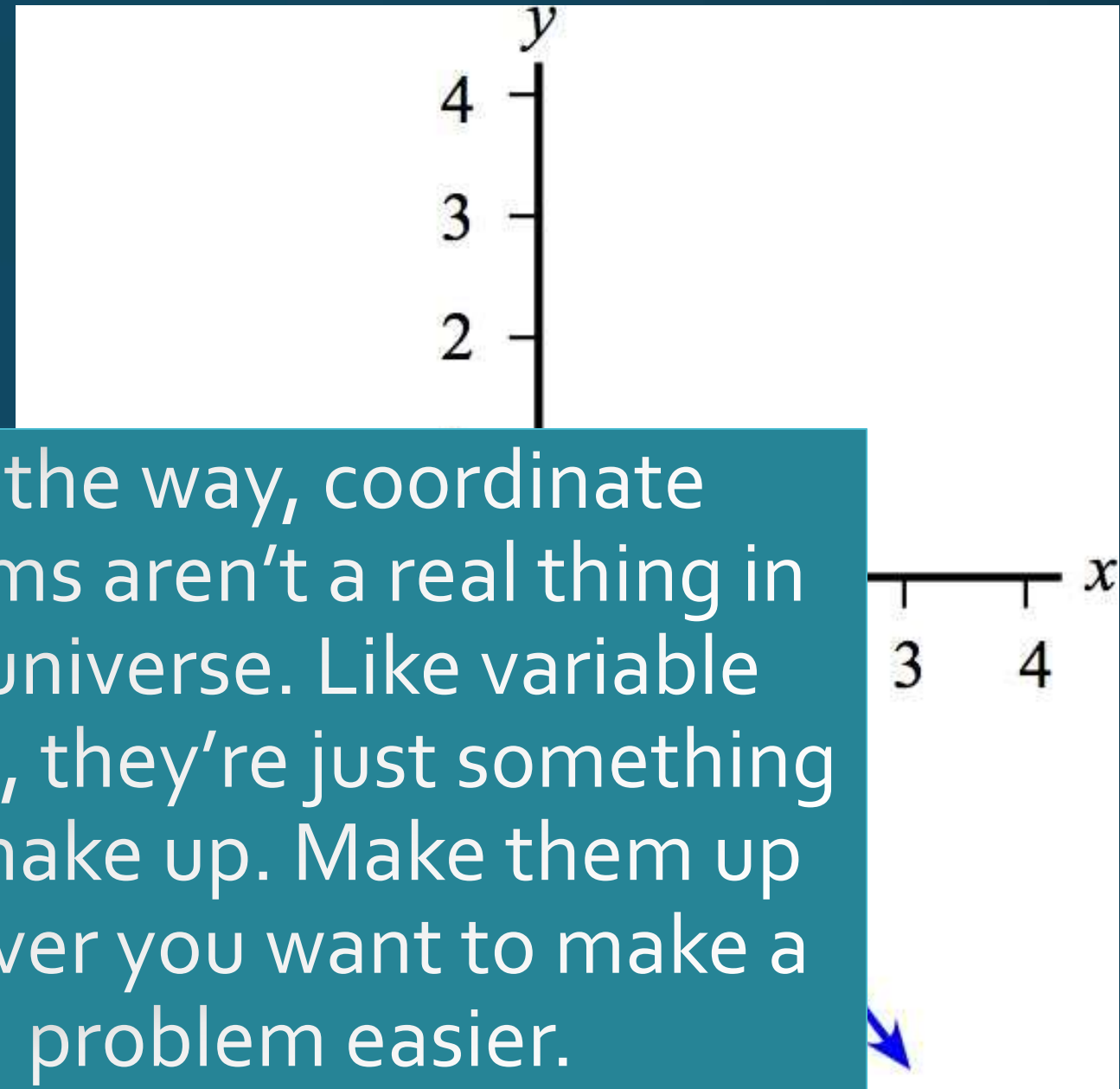
- A. $d_x = 3, d_y = -1$
- B. $d_x = 3, d_y = -4$**
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You can add vectors by adding their components separately

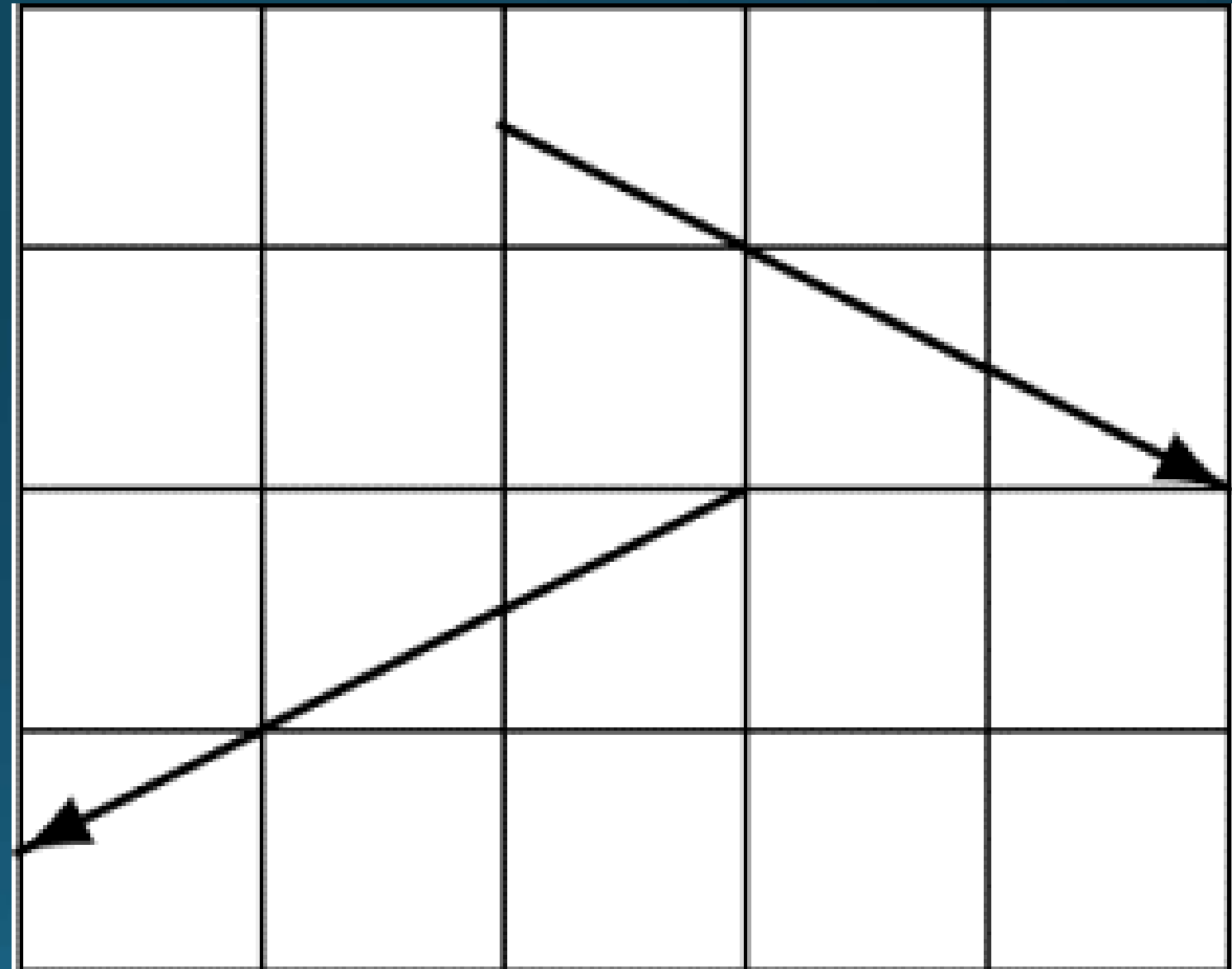
$$\vec{c} = \begin{bmatrix} 1 \text{ m} \\ 6 \text{ m} \\ -2 \text{ m} \end{bmatrix} \quad \vec{d} = \begin{bmatrix} 3 \text{ m} \\ 1 \text{ m} \\ 0 \text{ m} \end{bmatrix}$$

$$\vec{c} + \vec{d} = \begin{bmatrix} 1 \text{ m} + 3 \text{ m} \\ 6 \text{ m} + 1 \text{ m} \\ -2 \text{ m} + 0 \text{ m} \end{bmatrix} = \begin{bmatrix} 4 \text{ m} \\ 7 \text{ m} \\ -2 \text{ m} \end{bmatrix}$$

Concept Question

The sum of the two vectors shown in the figure most nearly points

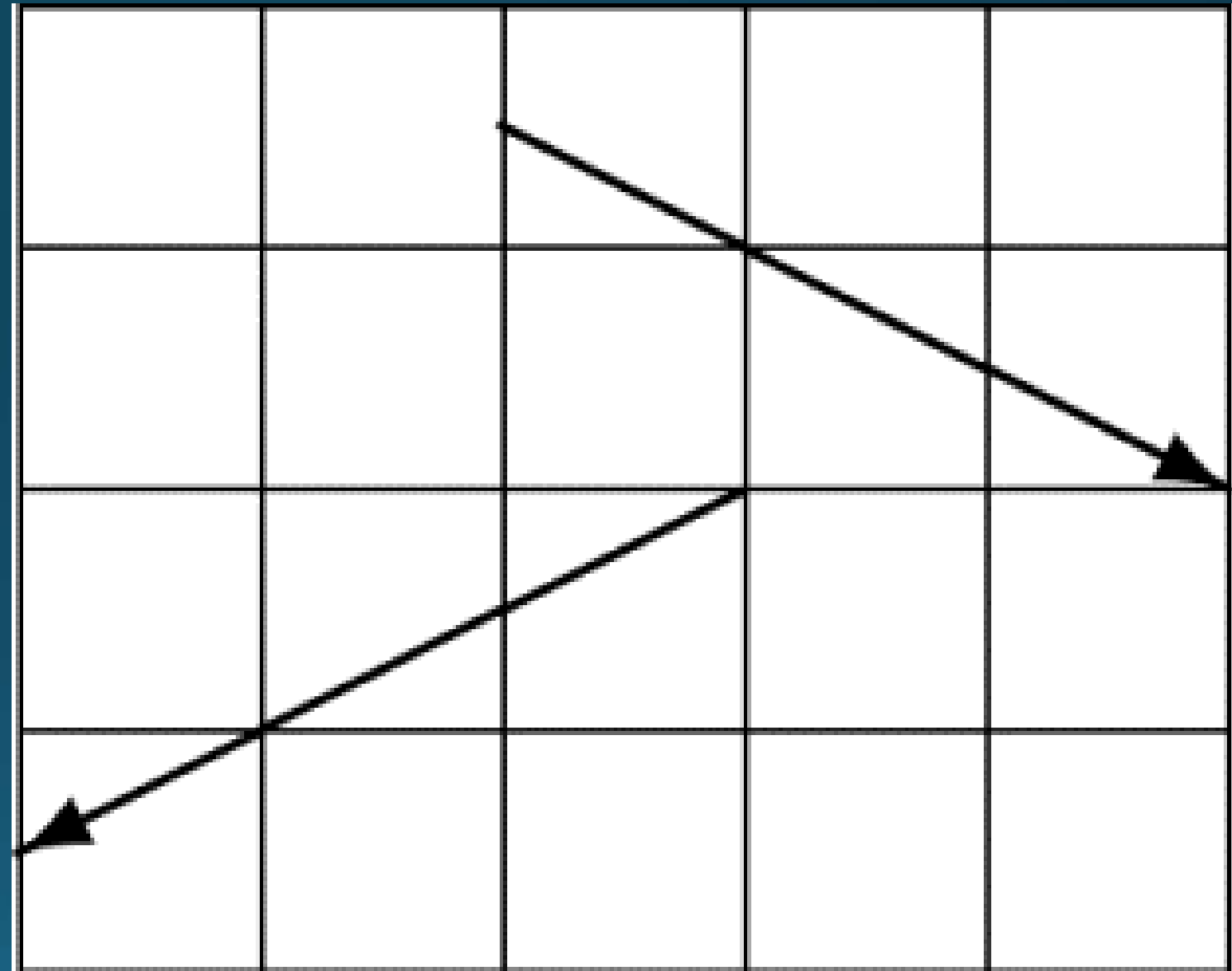
- A. Up
- B. Down
- C. Right
- D. Left



Concept Question

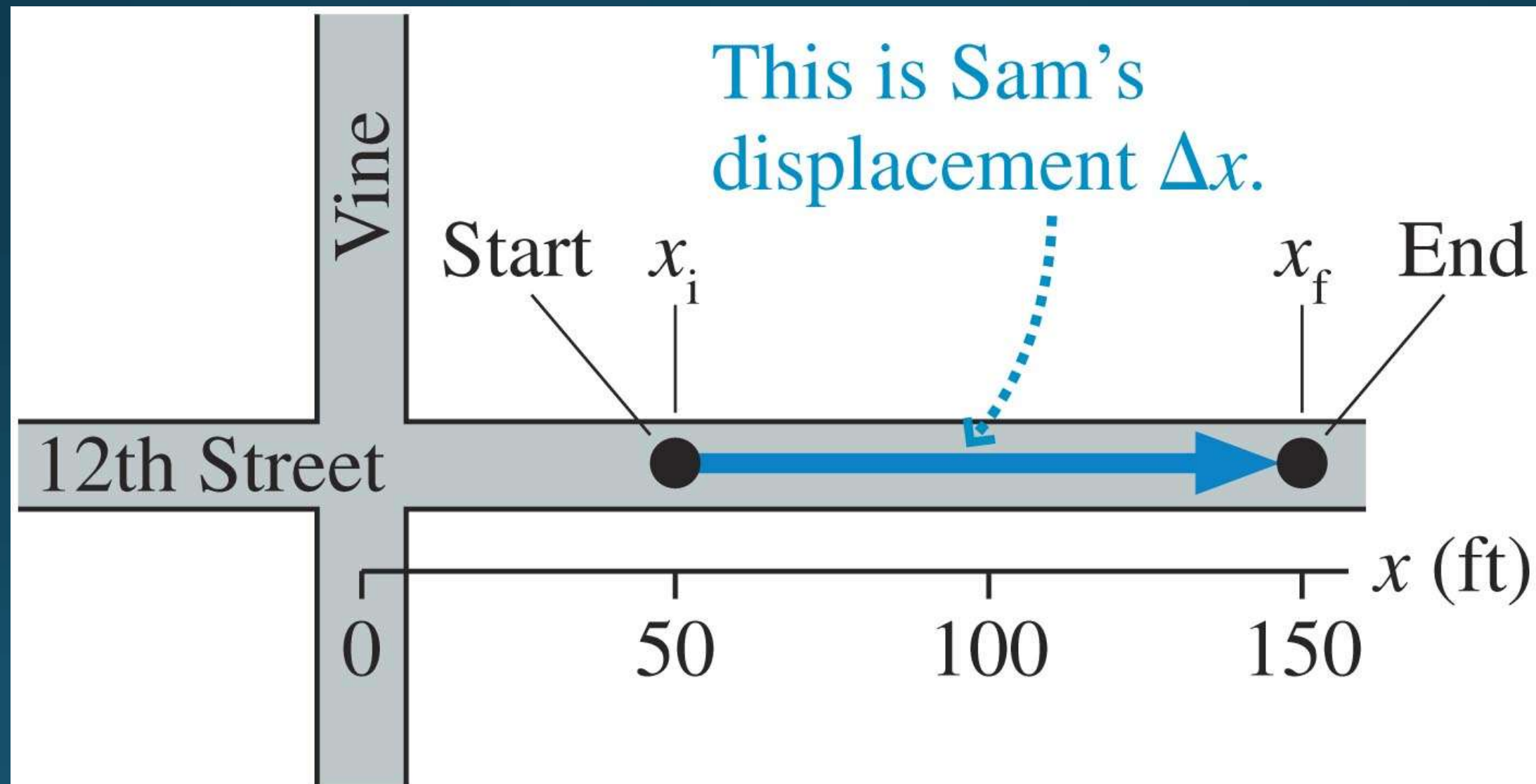
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Displacement

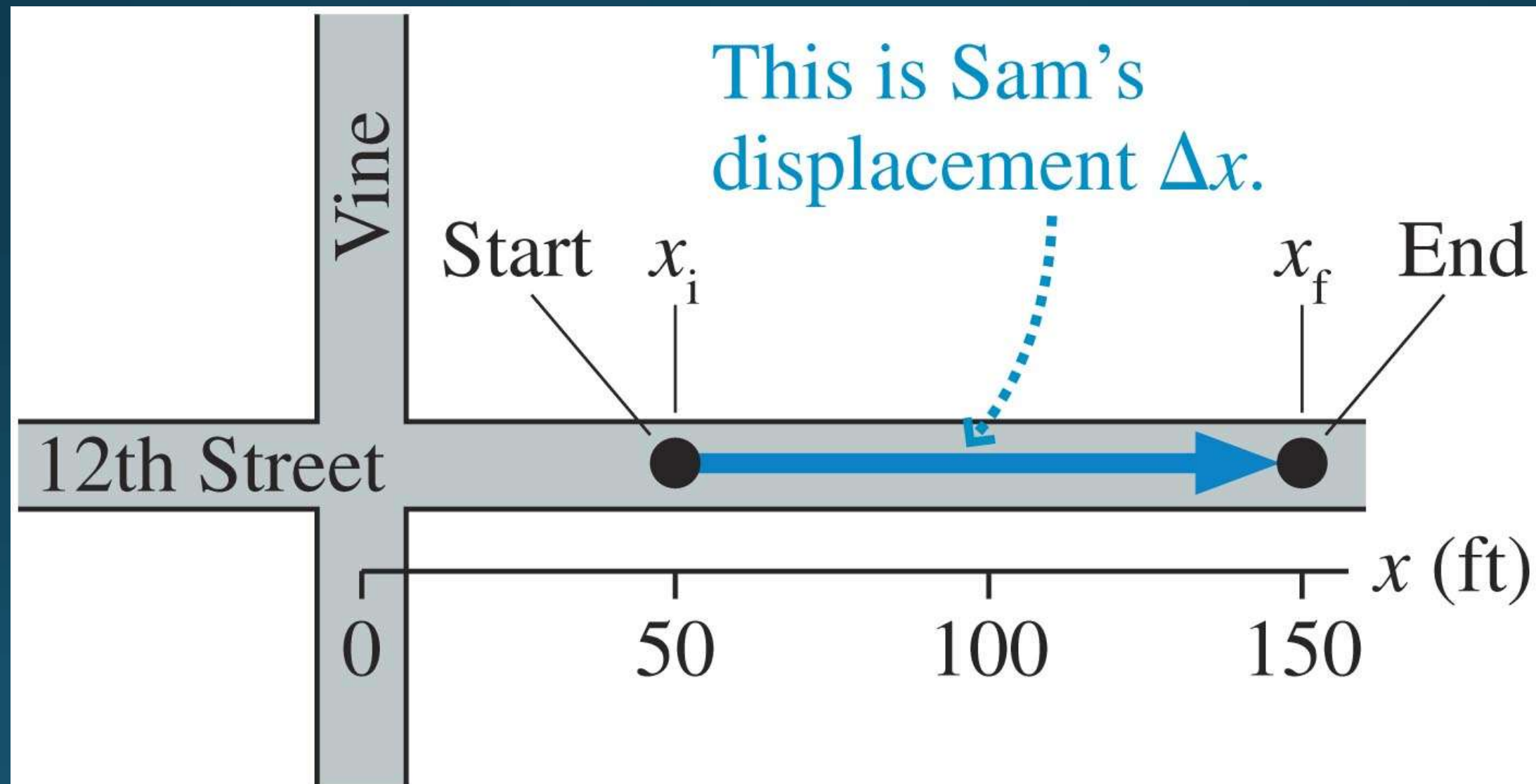
The *change* in the position of an object as it moves from initial position x_i to final position x_f is its *displacement* $\Delta x = x_f - x_i$. Consider Sam, walking on the road:



Displacement

“What variables would be used to differentiate distance and displacement? Would it just be d and x ? And for velocity, should we not use $v=d/t$?”

The *change* in the position of an object as it moves from initial position x_i to final position x_f is its *displacement* $\Delta x = x_f - x_i$. Consider Sam, walking on the road:



Checking Understanding

If Sam walks 100 m to the right, then 200 m to the left, which way does his net displacement vector point?

Checking Understanding

If Sam walks 100 m to the right, 50 m north, 10 m left, 50 m south, 10 m right, then 200 m to the left, his net displacement vector points

- A. to the right.
- B. to the left.
- C. has zero length.
- D. Cannot tell without more information.

Checking Understanding

If Sam walks 100 m to the right, 50 m north, 10 m left, 50 m south, 10 m right, then 200 m to the left, his net displacement vector points

A. to the right.

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What are his distance traveled and displacement?

Checking Understanding

If Sam walks 100 m to the right, 50 m north, 10 m left, 50 m south, 10 m right, then 200 m to the left, his net displacement vector points

A. to the right.

B. to the left.

C. has zero length.

D. Cannot tell without more information.

What are his distance traveled and displacement?

→ 420 m and -100 m, respectively

Checking Understanding

Maria is at position $x = 23$ m. She then undergoes a displacement $\Delta x = -50$ m. What is her final position?

- A. -27 m
- B. -50 m
- C. 23 m
- D. 73 m

Skipped in class, but still great practice!

Checking Understanding

Maria is at position $x = 23$ m. She then undergoes a displacement $\Delta x = -50$ m. What is her final position?

A. **-27 m**

B. -50 m

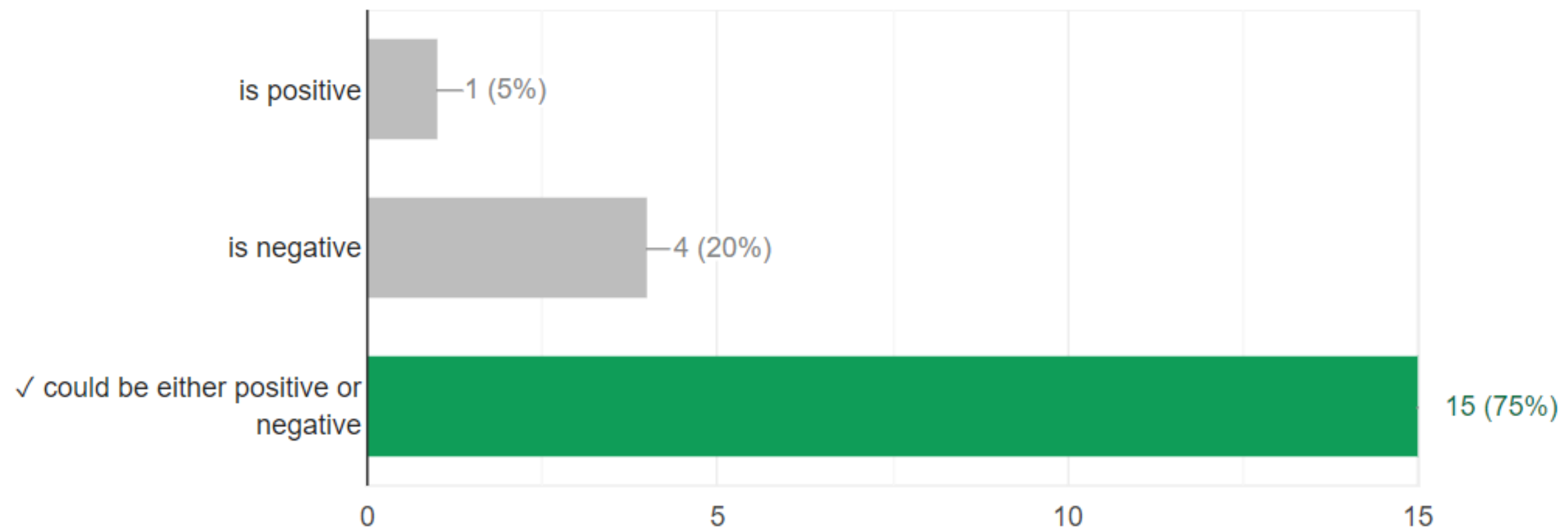
C. 23 m

D. 73 m

Skipped in class, but still great practice!

Sarah starts at a positive position along the x-axis. She then undergoes a negative displacement. Her final position

15 / 20 correct responses



Speed vs Velocity

Velocity

- A vector

- $v = \frac{\textit{displacement}}{\textit{time spent travelling}}$

Speed

- A scalar

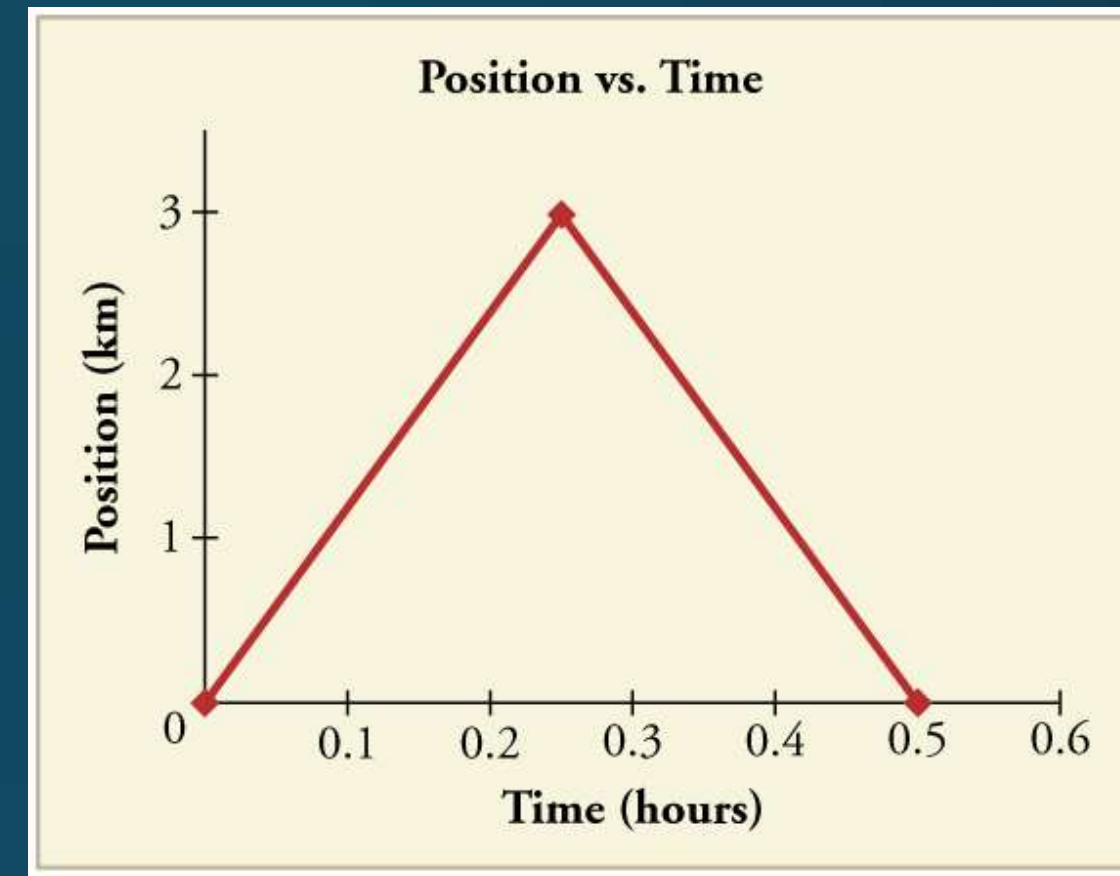
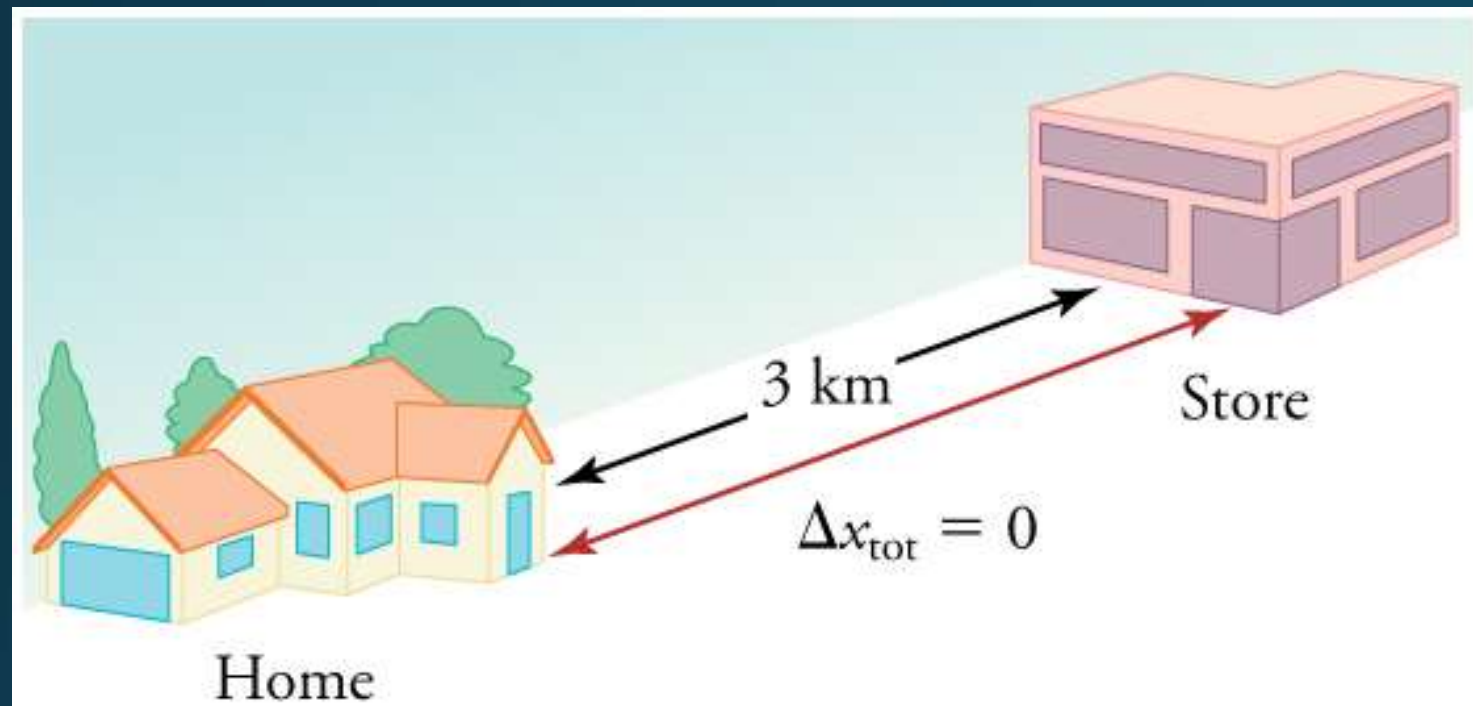
- The magnitude of the velocity

- $v = \frac{\textit{distance travelled}}{\textit{time spent travelling}}$

Concept Question

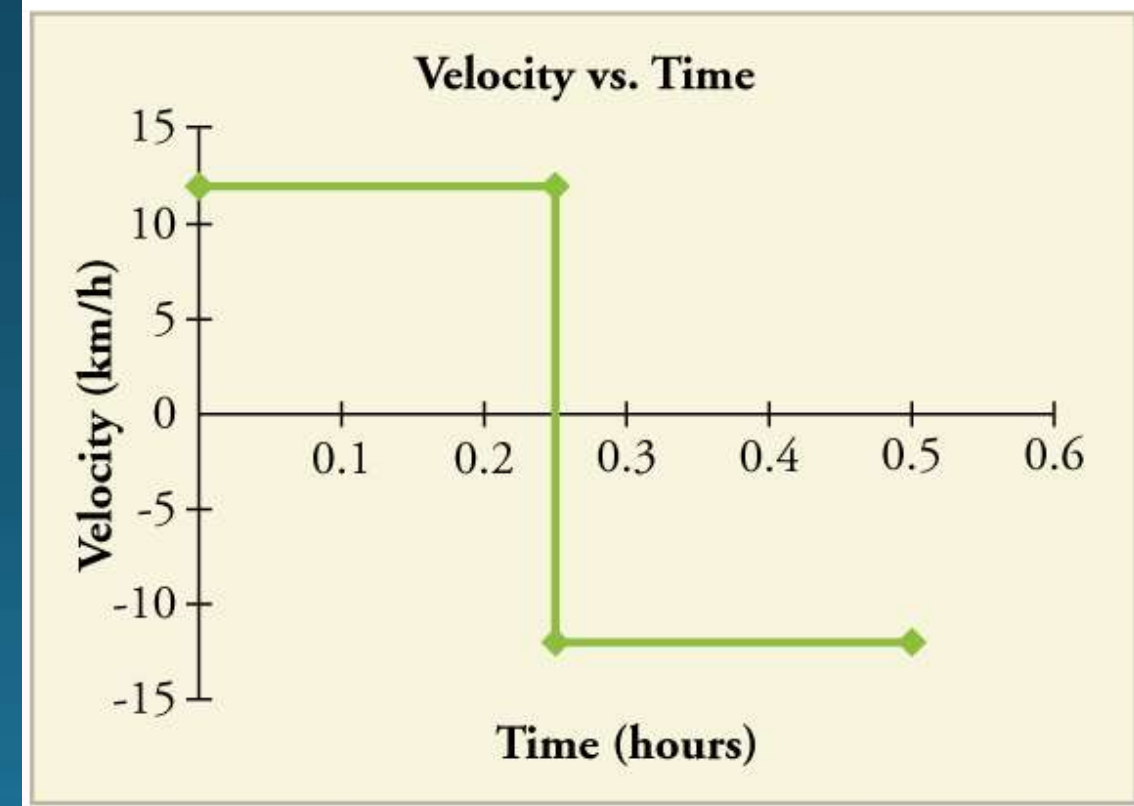
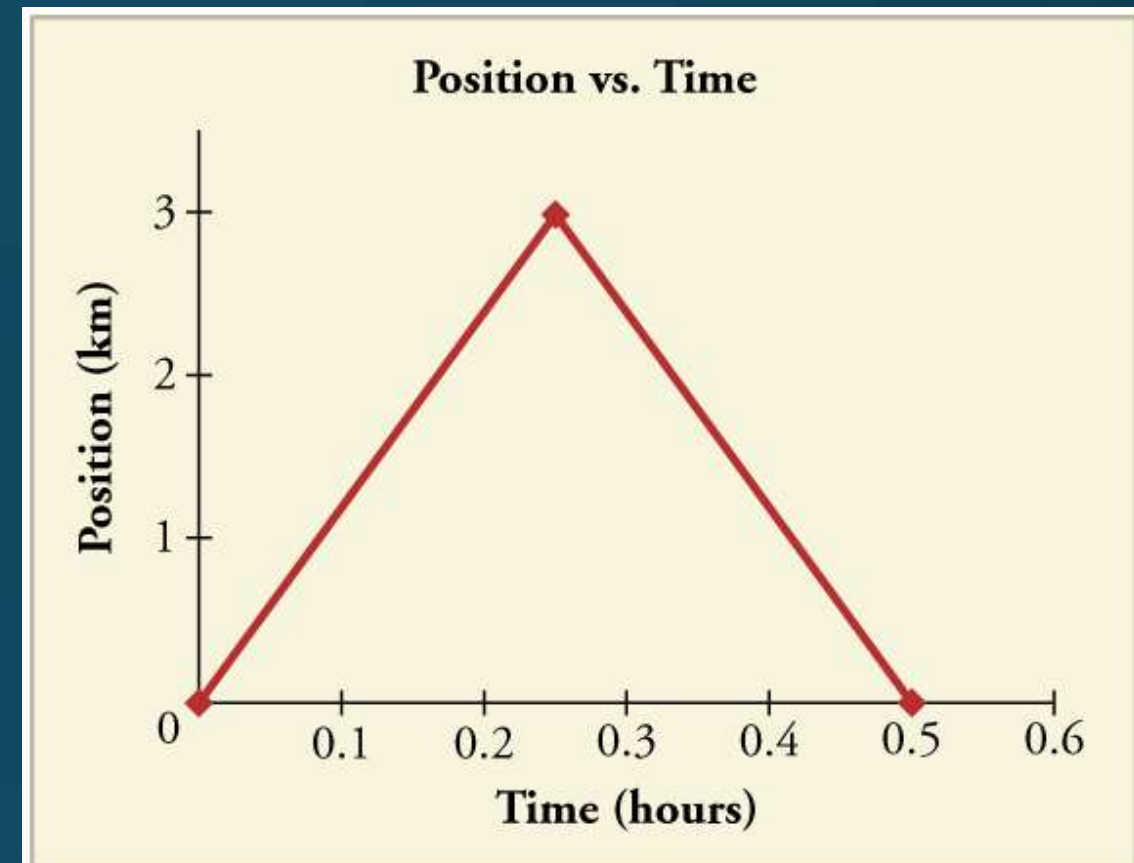
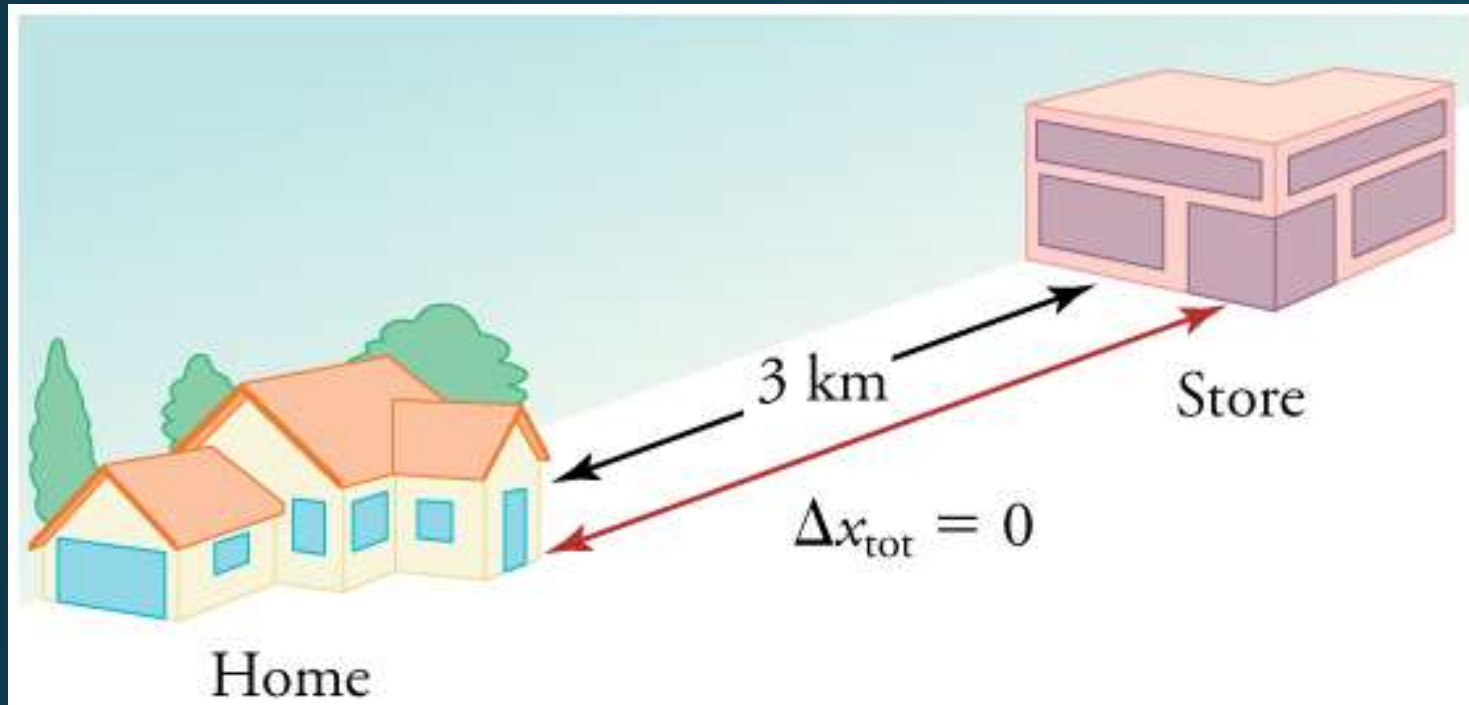
A car moves backward 10 meters in 2 seconds at a steady rate. The car's speed is therefore -5 m/s. True or false?

Position graphs



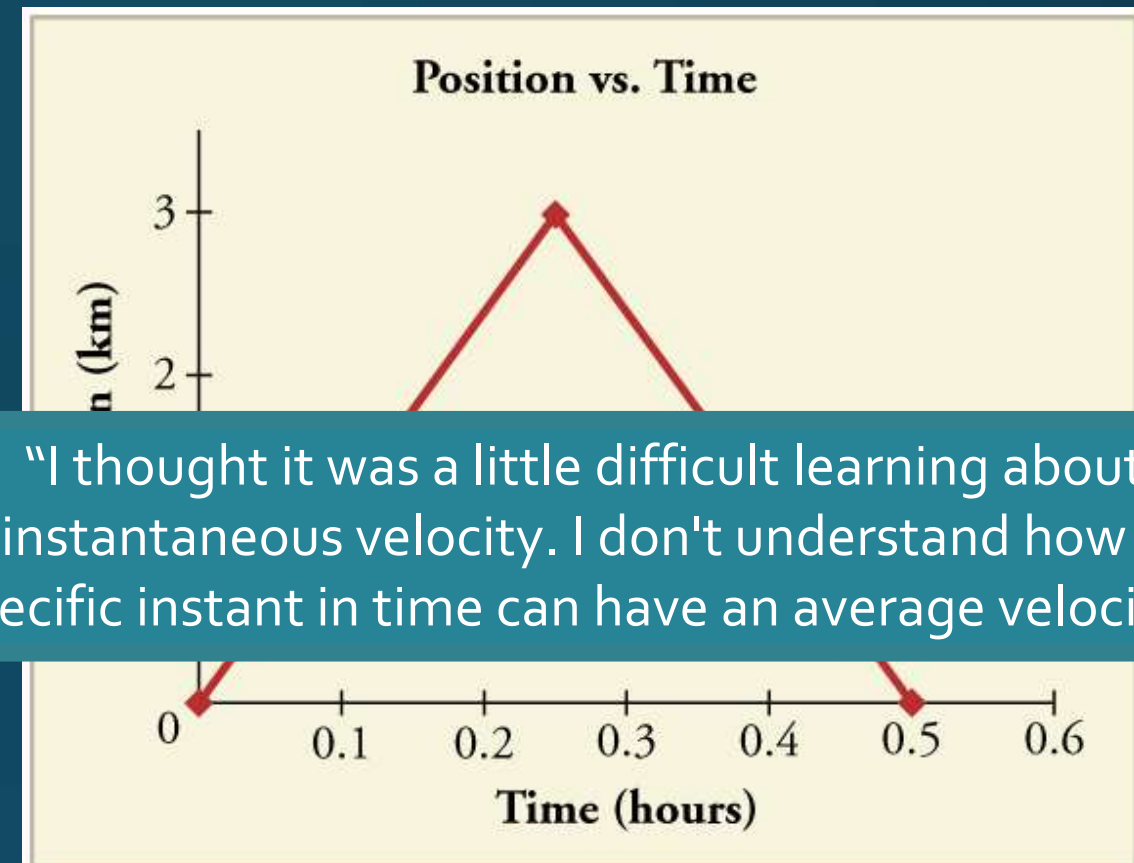
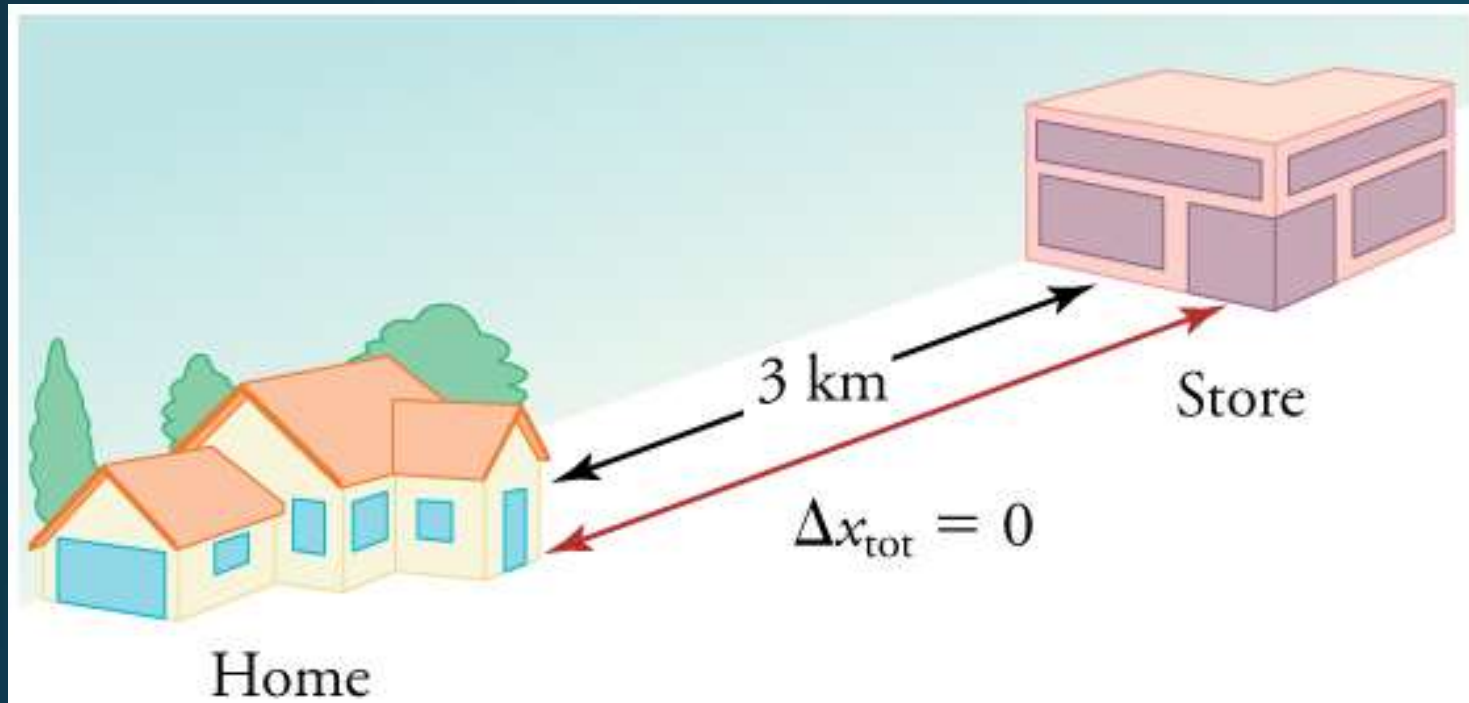
“It would be helpful to go over the diagrams in figure 2.11 at the end of section 2.3. If these are describing the house image just above it, do not make sense to me.”

Position graphs

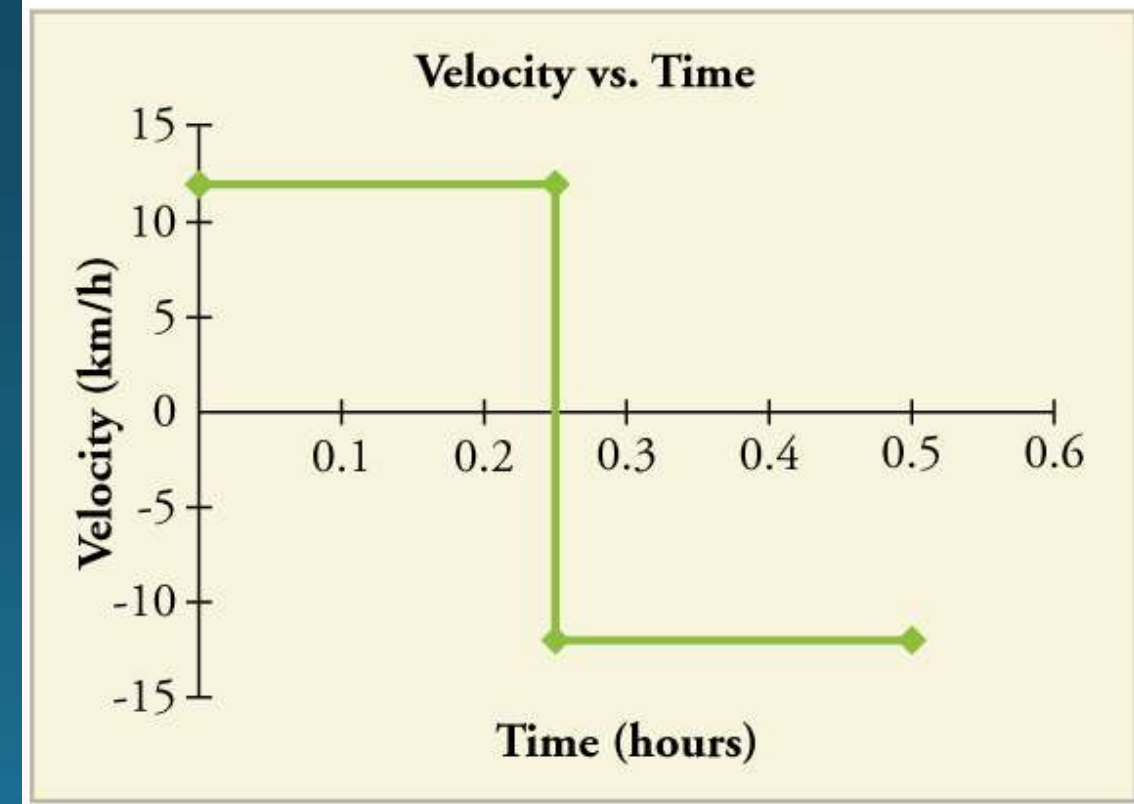


“It would be helpful to go over the diagrams in figure 2.11 at the end of section 2.3. If these are describing the house image just above it, do not make sense to me.”

Position graphs



"I thought it was a little difficult learning about instantaneous velocity. I don't understand how a specific instant in time can have an average velocity."



"It would be helpful to go over the diagrams in figure 2.11 at the end of section 2.3. If these are describing the house image just above it, do not make sense to me."