Graphs of Functional Relationships

Name: _____

Prerequisite: Compare Rates of Change

Study the example problem showing ways to compare functions. Then solve problems 1–6.

Example

Carmen buys a new bicycle. Her weekly payment plan is shown in the table. Sam also buys a new bicycle. His weekly payment plan is shown in the graph. Find the rate of change for each function and explain what it represents.

Sam's Payment Plan

Week	0	1	2	3	4
Amount Carmen Owes ($)	200	150	100	50	0

The amount Carmen owes decreases by $50 each week, so her rate of change is −$50.

The amount Sam owes decreases by $25 each week, so his rate of change is −$25.

Carmen pays more per week than Sam.

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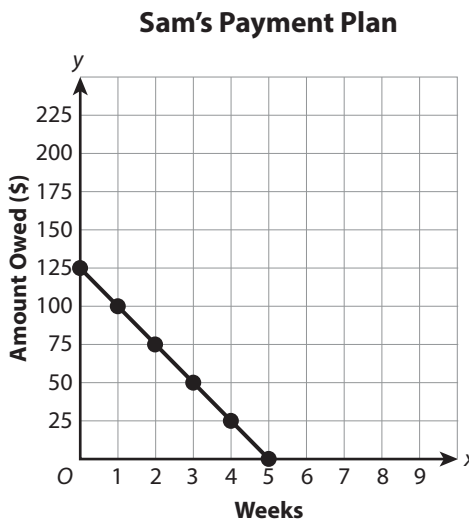
1 Graph Carmen's function on the same grid as Sam's function. Which line is steeper?

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2 How does the graph show that the rate of change is negative?

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3 Suppose Sam decides to pay for his bicycle in two equal weekly payments. How would that affect his rate of change? Would Sam pay more or less than Carmen each week?
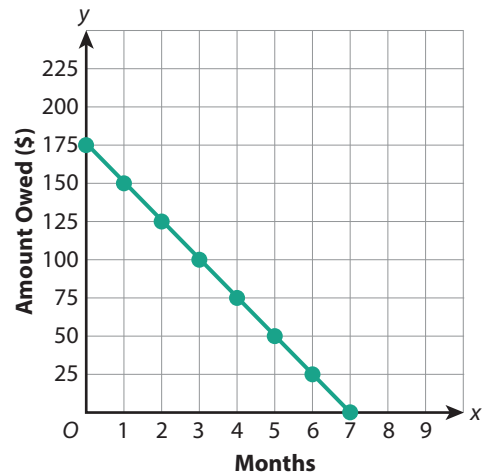
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Solve.

4 Hector wants to buy a new computer monitor. The prices and payment options are different at two stores. Which store plan has a greater monthly payment? Explain.
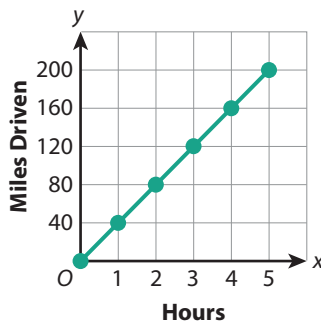
Store A Payment Plan

Price of $250. Pay $100 at the time of purchase. Pay $50 per month until the monitor is paid for.
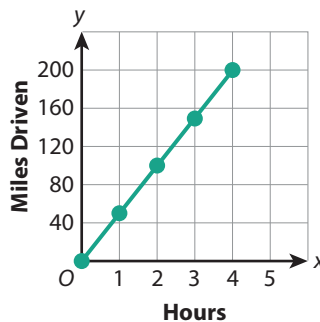
Store B Payment Plan

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5 Katia and Adam are both taking a 200-mile road trip. Their driving speeds are shown below.

Which driver has the greater rate of change? What does this mean in the context of the problem?

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6 Look at the graphs in problems 4 and 5. Which graphs have a positive rate of change? Which graphs have a negative rate of change? Explain how you know.
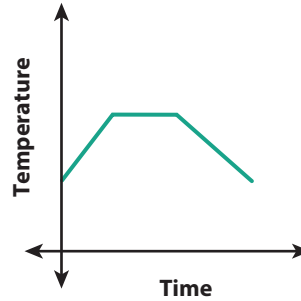
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Name: _____

Describe Qualitative Graphs

Study the example problem showing how to interpret a qualitative graph. Then solve problems 1–7.

Example

The graph shows the temperature for a day in a city. Summarize what the graph shows.

The temperature increases at the beginning of the day. It stays constant during the middle of the day. Then it decreases for the rest of the day.

1 Explain how the graph in the example shows that the temperature increases at the beginning of the day. What do you know about the slope of the line?
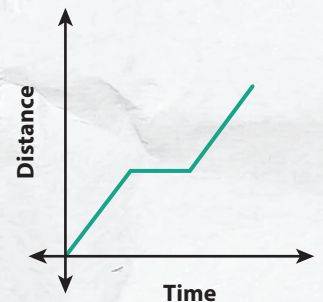
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2 Explain how the graph in the example shows that the temperature stays constant for a while.

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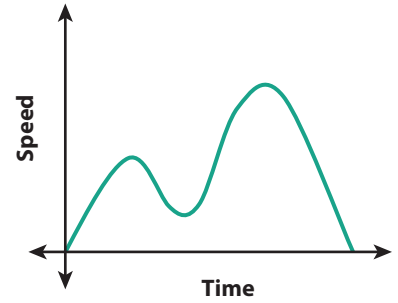**3** This graph shows the speed of a car on a city street. Describe and interpret section C of the graph.

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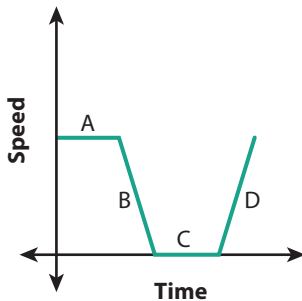
Vocabulary

**qualitative graph** a graph that represents a function visually, not with exact numbers.

Solve.

4 Summarize the graph showing the speed of a roller coaster.

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5 Suppose the label *Speed* in the graph for problem 4 is changed to *Height*. Explain how that would change your summary of the graph. Write a revised summary.

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6 This graph shows Raj's distance from school as he walks home at the end of the day. Describe what could be happening during each section of the graph.

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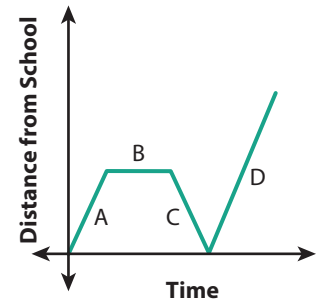
7 This graph shows the weight of a puppy over a 6-month period. Tamara says that the puppy's weight increased at a greater rate at the beginning of the 6-month period than at the end. Do you agree? Explain.

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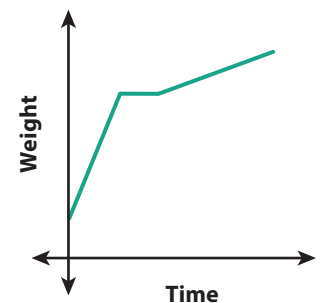
Draw Qualitative Graphs

Study the example showing how to draw a qualitative graph. Then solve problems 1–8.

Example

To draw a qualitative graph for a story, you can break a story into parts and then draw a section for each part.

Shane is riding his bike from home to the store and back.

A From his house, he rides at a constant rate until he gets to the store.

B He is at the store for a little while and

C starts to go back home. On the way home,

D he stops at a friend's house,

**E** then he rides the rest of the way home.
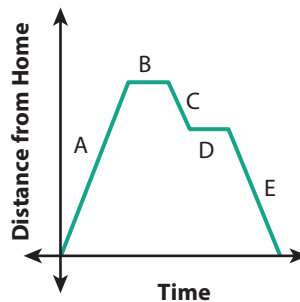
The graph shows Shane's distance from home compared to time.

1 Why does the line in section A slant upward?

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2 Why are the lines in sections B and D horizontal?

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3 The price of a cable company's service increases at a constant rate over time. Would a sketch of the graph show the price starting at 0? Explain why or why not. Then sketch a graph to show the price over time.

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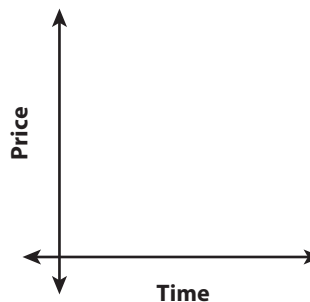
4 Suppose the cable service price in problem 3 increases as stated and then stays constant for a limited time before increasing again. Explain how the graph of this situation would differ from the graph in problem 3.

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Solve.

5 Adele starts driving home from work. On the way home, she stops at the grocery store. Adele then drives home from the store at a slower rate than the first part of her drive. Sketch a graph that shows Adele's distance from work compared to time.

6 Jacob and Angel are riding bikes on a bike trail. The first part of the trail is steep, so they ride at a slow rate. Halfway up, they stop and rest for several minutes. Then they slowly continue up the steep part of the trail. After reaching the highest part of the trail, they ride down at a constant rate that is faster than they rode up the first part of the trail. Sketch a graph to show the distance compared to time.

7 Sales of computers at Tech Smart decrease at a constant rate for the first few months of the year. Then sales level off and stay the same for a couple of months. Sales decrease again for a couple of months and finally increase gradually through the end of the year. Sketch a graph to show the sales compared to time. Explain your graph.
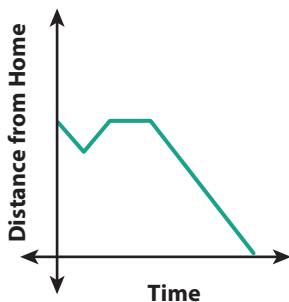

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8 Write a story for a qualitative graph. Sketch a graph for your story, and then write a description for each segment of your graph.

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Name: _____
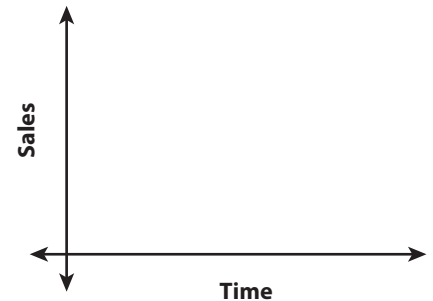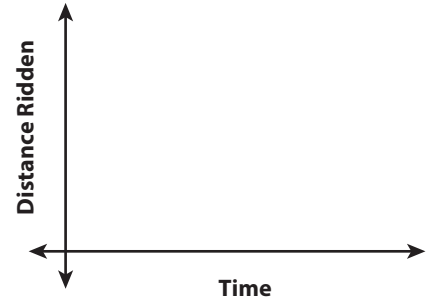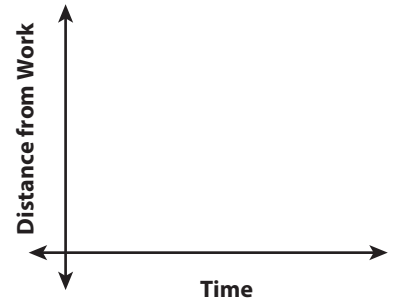
Graphs of Functional Relationships

Solve the problems.

**1** The graph represents Sophia's distance from home.

Make sure that you think about the details in each description and where the graph starts: home or work.

Which one of these situations matches the graph?

A Sophia starts driving home, stops on the way to pick up a friend, and then continues driving home.

B On the way home from work, Sophia makes two stops at different stores, staying in each store for a few minutes, and then drives home.

C Sophia starts driving home, realizes that she forgot her cell phone at work, drives back to work for her phone, and then drives home.

D Sophia walks to the bus stop, waits for the bus, then takes the bus home.

2 The battery life for Jacob's laptop decreases as he uses it while unplugged until it finally dies. It takes Jacob a while to find a place to charge the battery. When he finally plugs it in, the battery charges and gains more battery life. Sketch a graph to represent the situation.
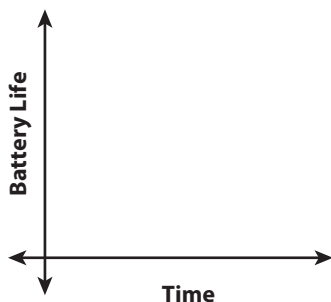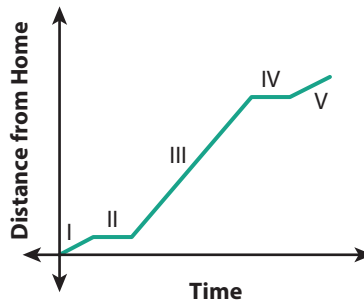
When will the graph be increasing or decreasing? When will it be neither?

Solve.

3 Mica takes a train to visit a friend. The graph shows Mica's trip from his home in New Jersey to his friend's house in Maine.

Which part of the graph shows Mica's wait at the train station in New Jersey?

Distance from Home (vertical axis), *Time* (horizontal axis); sections labeled I, II, III, IV, V.

In which state did Mica start his trip?

A I

B II

C IV

D V

Shakira chose **C** as the correct answer. How did she get that answer?

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4 This graph shows the temperature for a day in a city. Tell whether each statement is *True* or *False*.

Temperature (vertical axis), *Time* (horizontal axis); sections labeled I, II, III, IV.
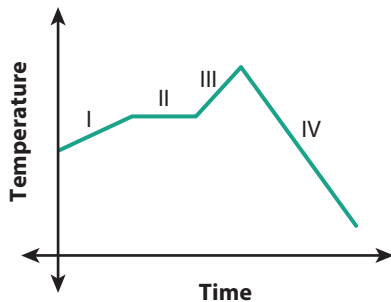
Compare each description to its corresponding section of the graph.

a. Section I: The temperature increases for a few hours.   ☐ True   ☐ False

b. Section II: The temperature decreases for few hours.   ☐ True   ☐ False

c. Section III: The temperature stays the same for a few hours.   ☐ True   ☐ False

d. Section IV: The temperature decreases from the high for the day until the end of the day.   ☐ True   ☐ False