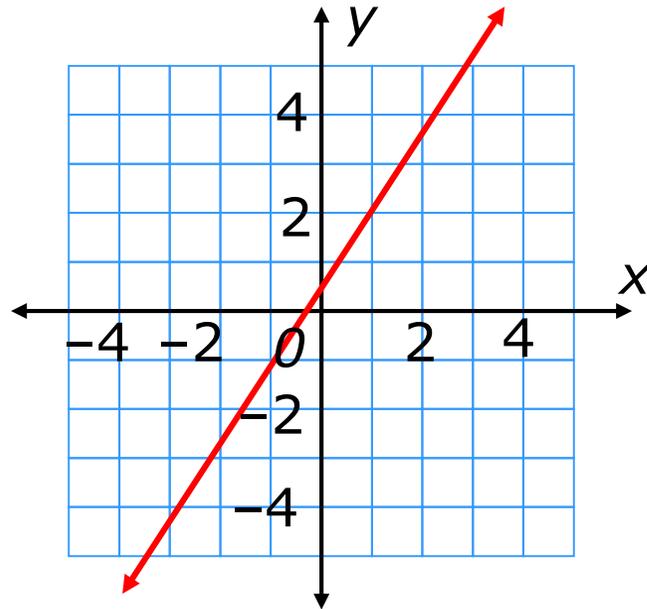




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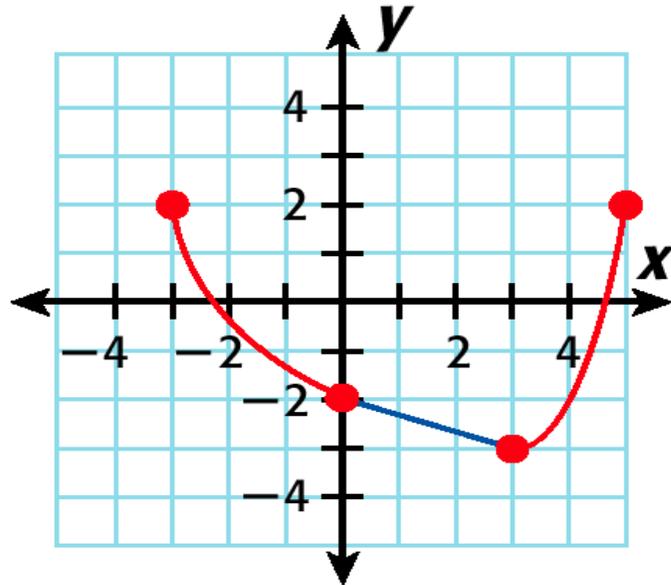
Rate of Change

A *constant rate of change* means that something changes by the same amount during equal intervals. A graph that has a constant rate of change is a line, and the *rate of change* is the same as the *slope* of the line.



Additional Example 1: Identifying Constant Rates of Change

Tell in which intervals of x the graph shows constant rates of change.



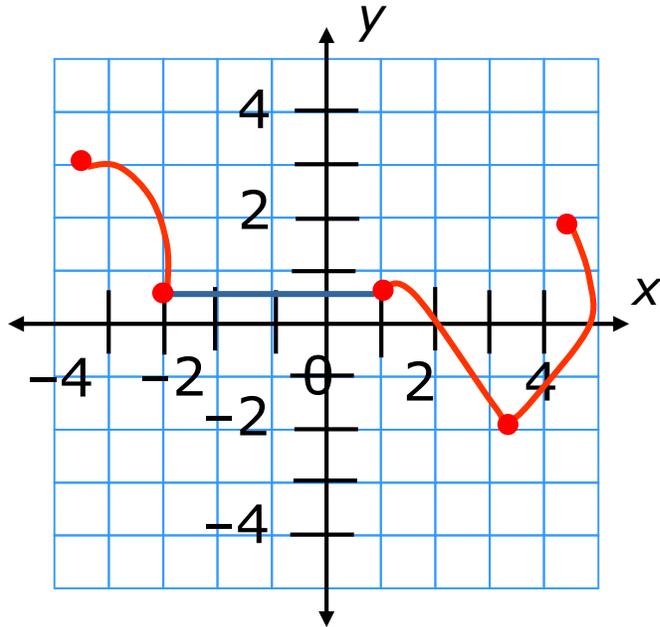
Look for parts of the graph that are line segments.

Identify the intervals of x for each line segment.

The graph shows a constant rate of change in the interval $x = 0$ to $x = 3$.

Try This: Example 1

Tell in which intervals of x the graph shows constant rates of change.



Look for parts of the graph that are line segments.

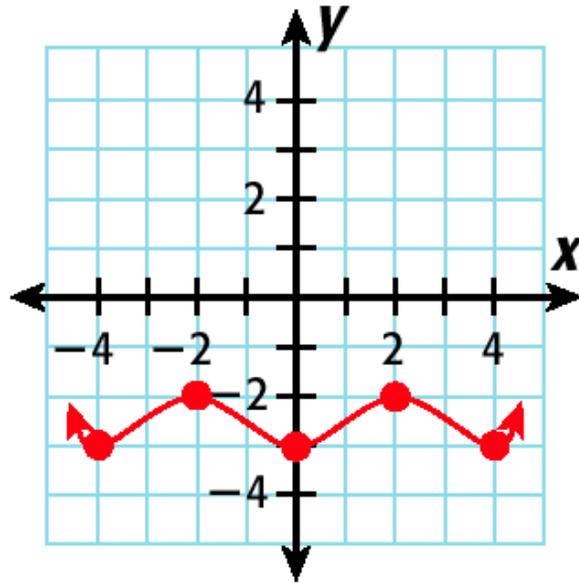
Identify the intervals of a x for each line segment.

The graph shows a constant rate of change in the interval $x = -3$ to $x = 1$.

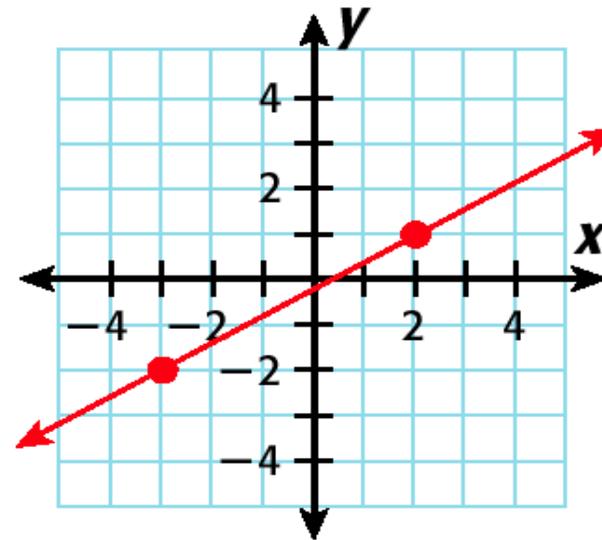
A variable rate of change means that something changes by a different amount during equal intervals. Variable rates of change are also called nonlinear rates of change, because a graph that represents a variable rate of change is not a line.

Additional Example 2: Identifying Rates of Change

Tell whether each graph shows a constant or variable rate of change.



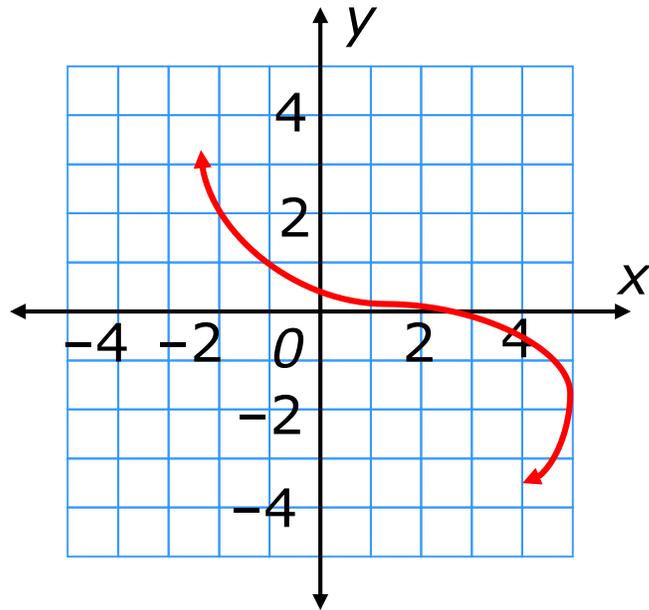
The graph is nonlinear, so the rate of change is variable.



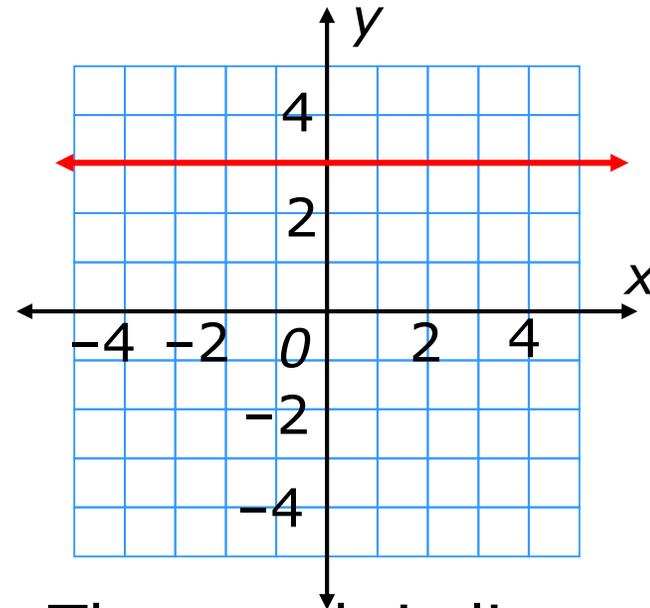
The graph is linear, so the rate of change is constant.

Try This: Example 2

Tell whether each graph shows a constant or variable rate of change.



The graph is nonlinear,
so the rate of change is
variable.



The graph is linear, so
the rate of change is
constant.



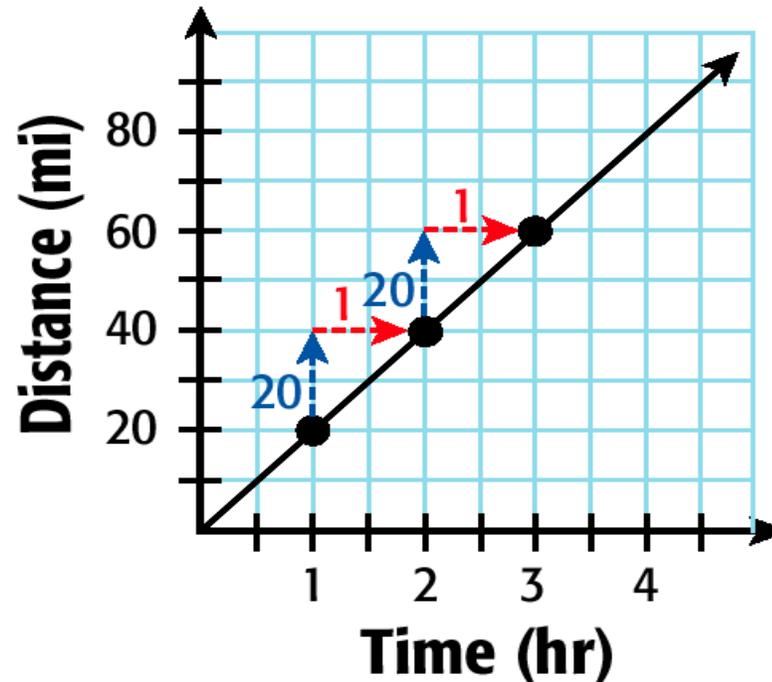
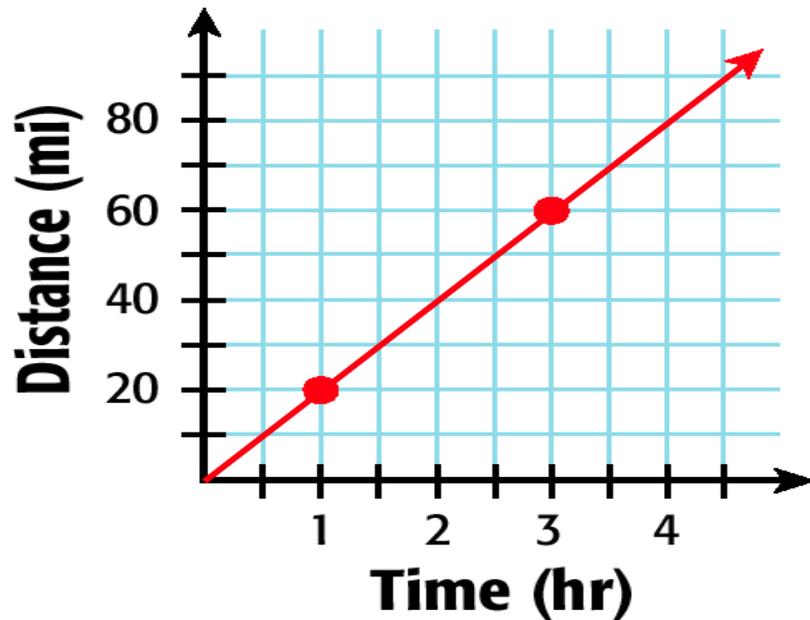
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Remember!

$$\text{slope} = \frac{\text{rise}}{\text{run}}$$

Additional Example 3: Using Rate of Change to Solve Problems

The graph shows the distance a monarch butterfly travels at a constant rate of speed. How fast is the butterfly traveling?



Additional Example 3 Continued

The graph is linear. You can see that the same amount of distance (rise) is traveled during equal time intervals (run), so the butterfly is traveling at a constant rate of speed.

The slope of the graph is $\text{rise} \div \text{run}$, or $\text{distance} \div \text{time}$.

Since $\text{speed} = \text{distance} \div \text{time}$, you can find the speed by finding the slope.

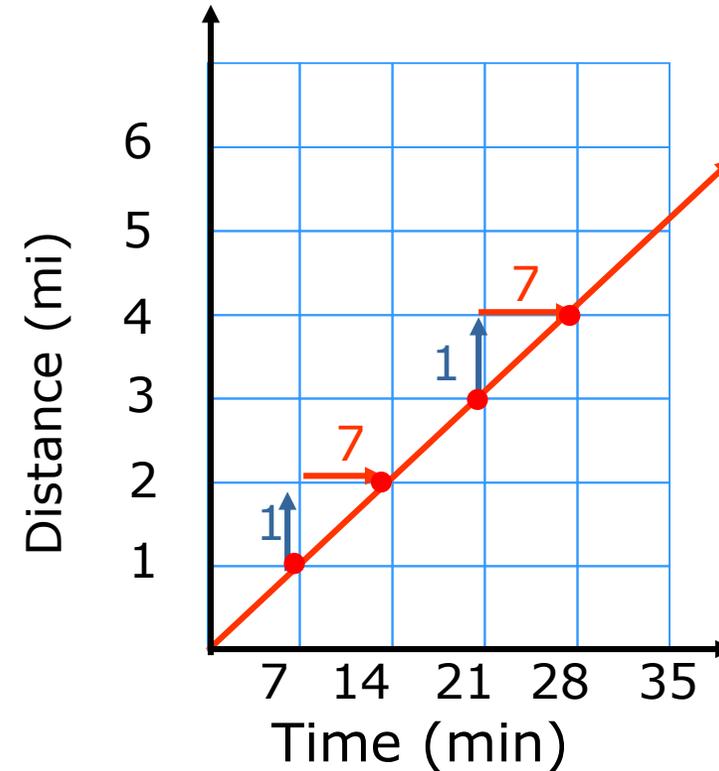
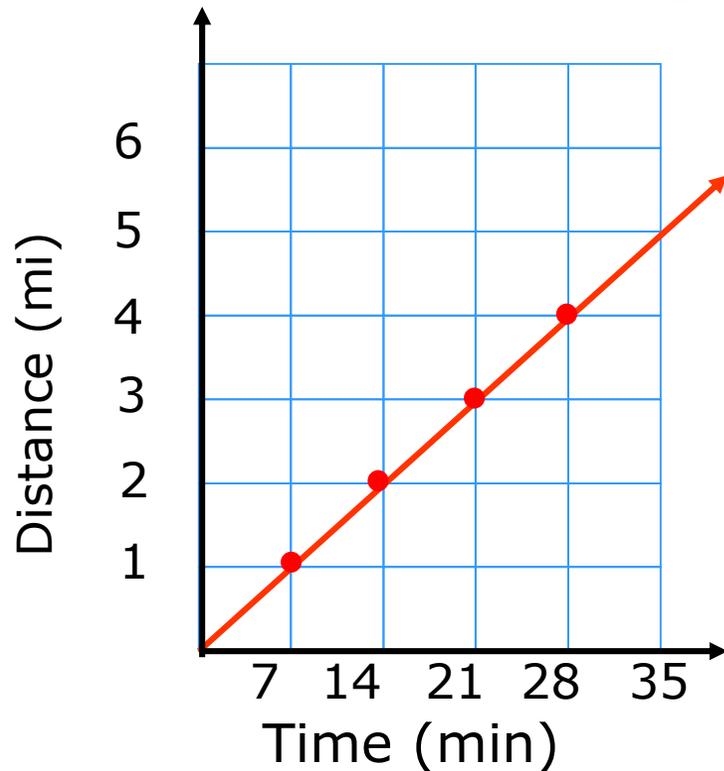
$$\text{slope} = \frac{\text{rise}}{\text{run}} = \frac{20 \text{ miles}}{1 \text{ hour}}$$

Use two points on the line such as (1, 20) and (2, 40), to find the slope.

The butterfly travels at a rate of 20 miles per hour.

Try This: Example 3

The graph shows the distance a jogger travels over time. Is he traveling at a constant or variable rate. How fast is he traveling?



Try This: Example 3

The graph is linear. You can see that the same amount of distance (rise) is traveled during equal time intervals (run), so the jogger is traveling at a constant rate of speed.

Since speed = distance \div time, you can find the speed by finding the slope.

$$\text{Slope} = \frac{\text{rise}}{\text{run}} = \frac{1 \text{ mi}}{7 \text{ min}}$$

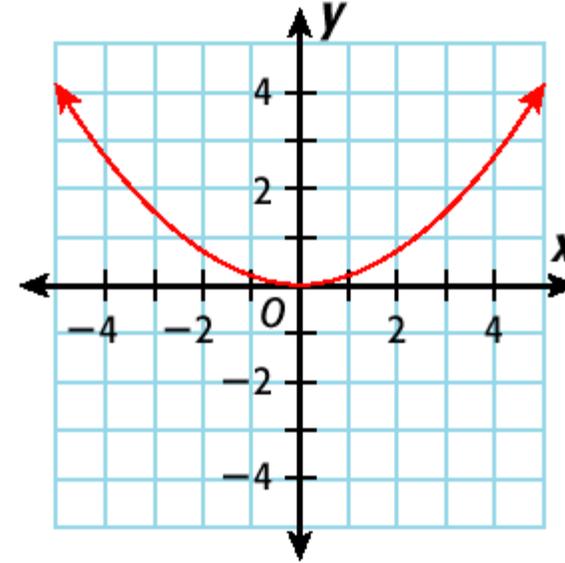
Use two points on the line such as (1, 7) and (2, 14) to find the slope.

The jogger travels at a rate of 1 mile every 7 minutes.

Lesson Quiz

1. Tell whether the graph shows a variable or constant rate of change.

variable rate of change



2. During a flood, a river rose 0.5 inch per minute. In another flood, the river rose 2 feet per hour. Which rate of change was higher?

0.5 inch/minute