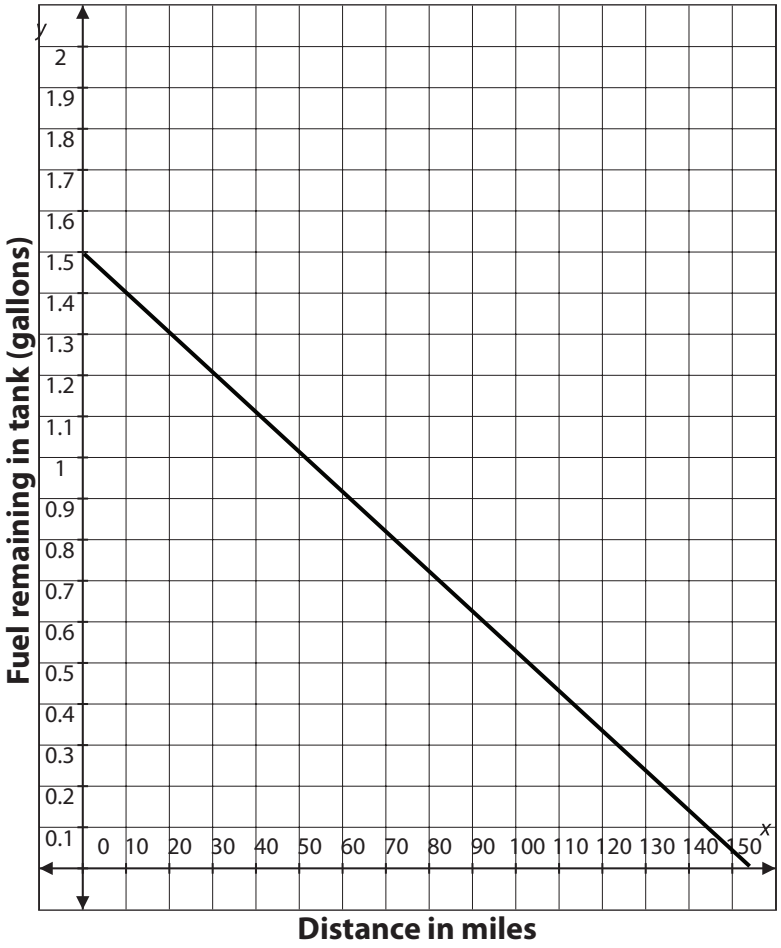
Instruction

Guided Practice 3.3.3

Example 1

The graph below compares the distance a small motor scooter can travel in miles to the amount of fuel used in gallons. What is the rate of change for this scenario?



1. Determine the interval to be observed.

   The function is linear, so the rate of change will be constant for any interval of the function.

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2. Choose a starting point of the interval.

   Choose a point on the graph with coordinates that are easy to estimate.

   It appears as though the line crosses the y-axis at the point (0, 1.5).

   Let (0, 1.5) be the starting point of the interval.

3. Choose an ending point of the interval.

   Choose another point on the graph with coordinates that are easy to estimate.

   It appears as though the line crosses the x-axis at the point (155, 0).

   Let (155, 0) be the ending point of the interval.

4. Substitute (0, 1.5) and (155, 0) into the slope formula to calculate the rate of change.

$$\frac{y_2 - y_1}{x_2 - x_1}$$ Slope formula

$$= \frac{0 - 1.5}{155 - 0}$$ Substitute (0, 1.5) and (155, 0) for (x_1, y_1) and (x_2, y_2).

$$= \frac{-1.5}{155}$$ Simplify as needed.

$$\approx -0.01$$

The rate of change for this function is approximately –0.01 gallons per mile. The amount of fuel decreases by 0.01 gallons per mile.

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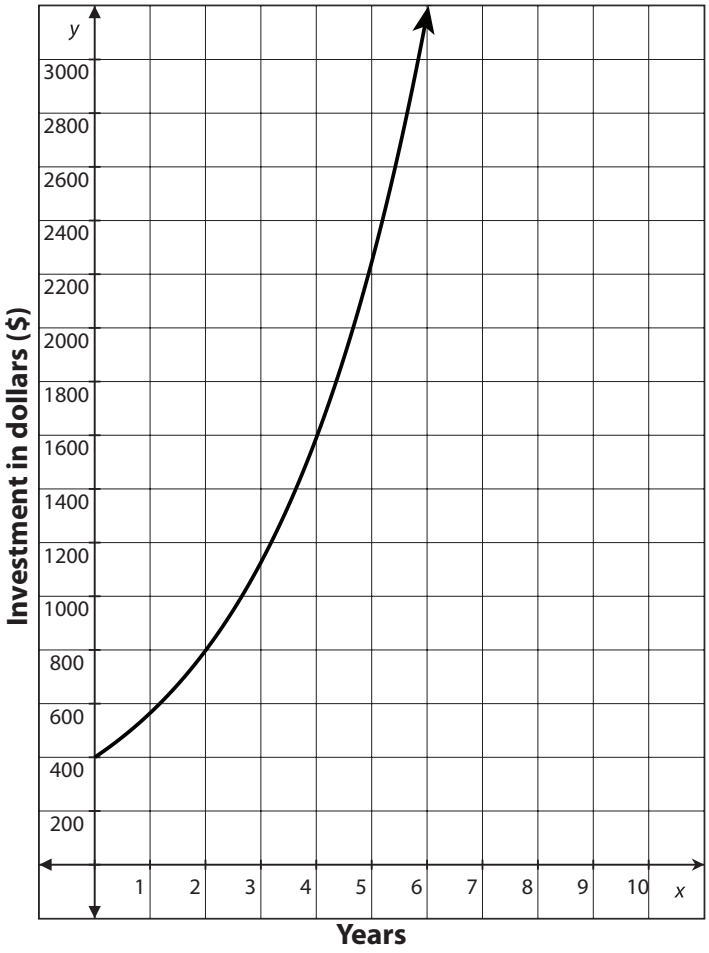
Example 2

Jasper has invested an amount of money into a savings account. The graph below shows the value of his investment over a period of time. What is the rate of change for the interval [1, 3]?



1. Determine the interval to be observed.

   The interval to observe is [1, 3], or where $1 \leq x \leq 3$.

2. Identify the starting point of the interval.

   The x-value of the starting point is 1. The corresponding y-value is approximately 550.

   The starting point of the interval is (1, 550).

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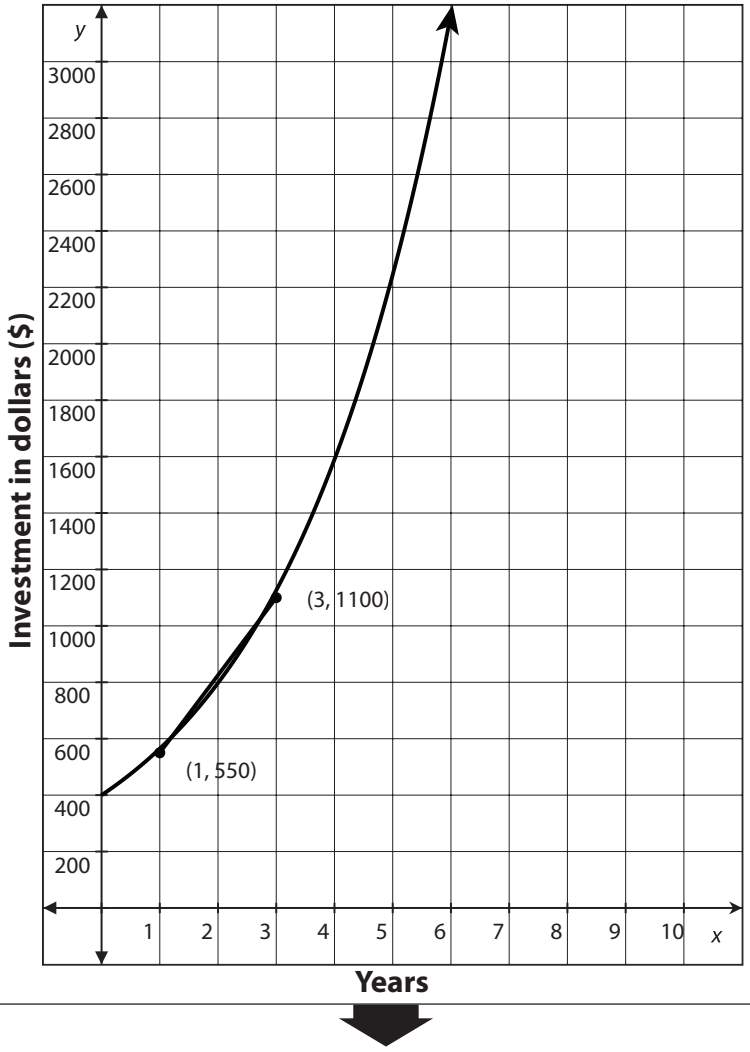
3. Identify the ending point of the interval.

   The *x*-value for the ending point is 3. The corresponding *y*-value is approximately 1,100.

   The ending point of the interval is (3, 1100).



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4. Substitute (1, 550) and (3, 1100) into the slope formula to calculate the rate of change.

$\frac{y_2 - y_1}{x_2 - x_1}$ Slope formula

$= \frac{1100 - 550}{3 - 1}$ Substitute (1, 550) and (3, 1100) for (x_1, y_1) and (x_2, y_2).

$= \frac{550}{2}$ Simplify as needed.

$= 275$

The rate of change for this function over the interval [1, 3] is approximately \$275 per year.

Example 3

Jasper is curious about how the rate of change differs for the interval [3, 6]. Calculate the rate of change using the graph from Example 2.

1. Determine the interval to be observed.

   The interval to observe is [3, 6], or where $3 \leq x \leq 6$.

2. Identify the starting point of the interval.

   The *x*-value of the starting point is 3. The corresponding *y*-value is approximately 1,100.

   The starting point of the interval is (3, 1100).

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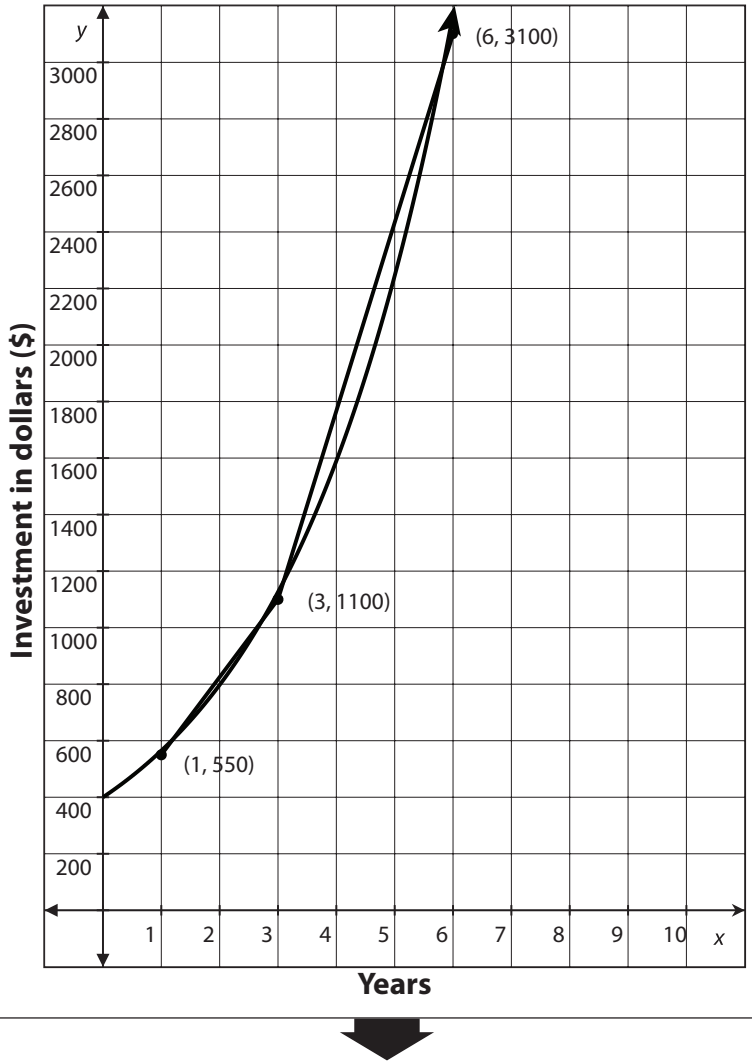
3. Identify the ending point of the interval.

   The *x*-value for the ending point is 6. The corresponding *y*-value is approximately 3,100.

   The ending point of the interval is (6, 3100).



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4. Substitute (3, 1100) and (6, 3100) into the slope formula to calculate the rate of change.

$$\frac{y_2 - y_1}{x_2 - x_1}$$ Slope formula

$$= \frac{3100 - 1100}{6 - 3}$$ Substitute (3, 1100) and (6, 3100) for (x_1, y_1) and (x_2, y_2).

$$= \frac{2000}{3}$$ Simplify as needed.

$$\approx 666.67$$

The rate of change for this function over the interval [3, 6] is approximately \$666.67 per year.

Notice that the rate of change for the interval [3, 6] is much steeper than that of the interval [1, 3].

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