

Lesson 2.4: Functions and their Graphs

What you should be able to do at the end of the lesson:

- ~ Find the Domain of a Function
- ~ Obtain Information from the Graph of a Function
- ~ Interpret Graphs of Functions

Lesson 2.4: Functions and their Graphs

When we are working with functions, we need to figure out what "inputs" will make sense for the function. Most of the time, the "inputs" are not specified - only the equation of the function.

We need to be able to determine what the DOMAIN or the "inputs" of the function are.

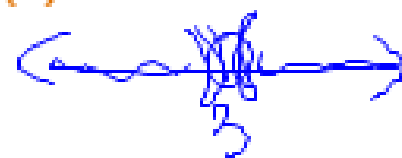
Definition:

When only the equation of a function is given, we agree that the domain of f is the largest set of real numbers for which $f(x)$ is a real number.

Remember: $f(x)$ is y or the "output" of the function.

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Finding the Domain of a function: The domain of a function is the same thing as the domain of the variable x in $f(x)$.



Find the Domain for each of the functions:

a.) $f(x) = 3x^2 + 2$

$$D: \mathbb{R} \\ (-\infty, \infty)$$

b.) $h(x) = \frac{x+1}{x-3} \quad x \neq 3$

$$D: \{x \mid x \neq 3\} \\ (-\infty, 3) \cup (3, \infty)$$

c.) $G(z) = \frac{z-3}{z+1}$

$$D: \{z \mid z \neq -1\} \\ (-\infty, -1) \cup (-1, \infty)$$

d.) $g(x) = x^2 + 1$

$$D: \mathbb{R} \\ (-\infty, \infty)$$

Lesson 2.4: Functions and their Graphs

We use functions to model things in real life. But we often have to limit our domain so it makes sense in the real life situation.

For example: If we had a function of time, we could only start at zero and go on. We can't have negative time because that just doesn't make sense.

It's the same for a function of distance. We can't have negative distance, so we just have to limit our domain to start at zero.

Find the Domain of the function described:

The number N of computers produced at one of Dell Computers manufacturing facilities in one day after t hours is given by this function:

$$N(t) = 336t - 7t^2$$

What is the Domain of this function?

$$D = \{t \mid 0 \leq t \leq 24\}$$

$$[0, 24]$$

Find the Domain of the function described:

The speed V of a car as a function of time t (in seconds) for the first minute after acceleration is given by

$$V(t) = 5t$$

What is the Domain of the function?

$$\{t \mid 0 \leq t \leq 60\}$$

$$[0, 60]$$

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Obtain information from a graph of a function:

a.) Determine the domain and range of the function.

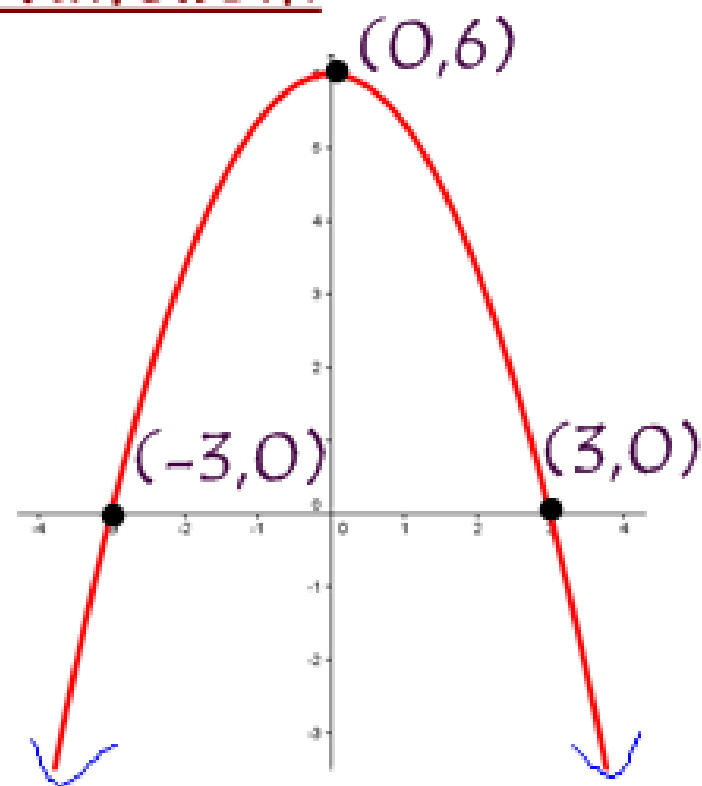
$$D: \mathbb{R} \text{ or } (-\infty, \infty)$$

$$R: \{y \mid y \leq 6\}$$
$$(-\infty, 6]$$

b.) Identify the intercepts.

$$X\text{-int: } (-3, 0) \quad (3, 0)$$

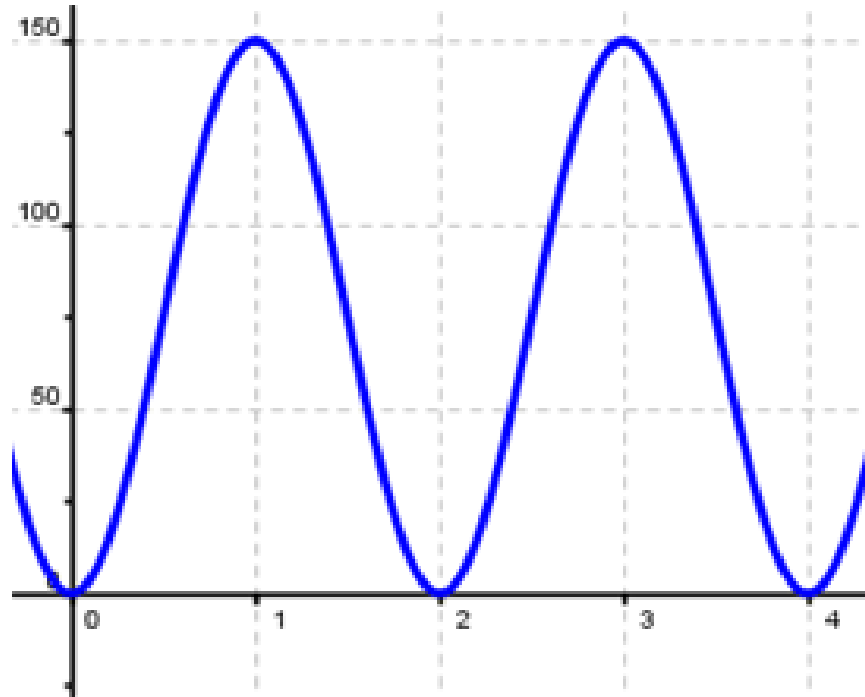
$$Y\text{-int: } (0, 6)$$



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Obtain information from a graph of a function:

The Wonder Wheel is a Ferris wheel located on Coney Island. Let f be the distance above the ground of a person riding on the Wonder Wheel as a function of time x (in minutes). Use the graph to answer the following questions.

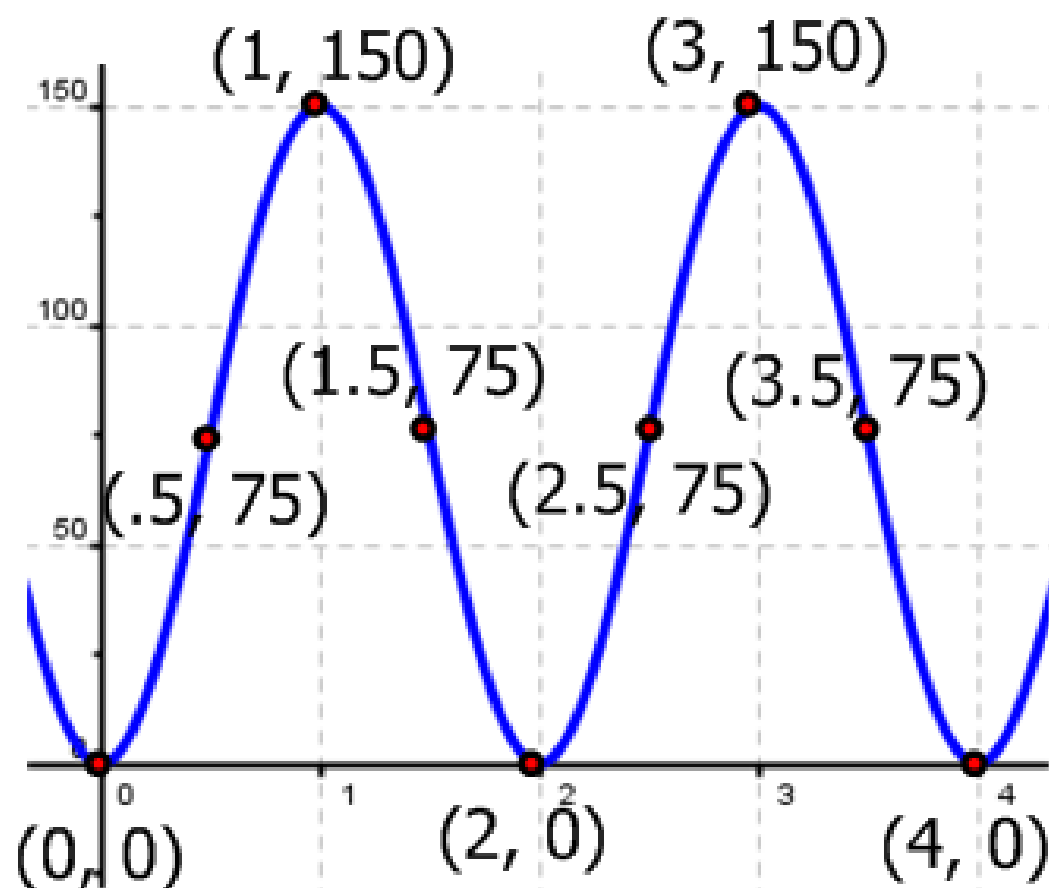


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The Wonder Wheel:



a.) What are $f(1.5)$ and $f(3)$?
Interpret these values.



$$f(1.5) = 75$$

After 1.5 min, you are
75 ft above ground.

$$f(3) = 150$$

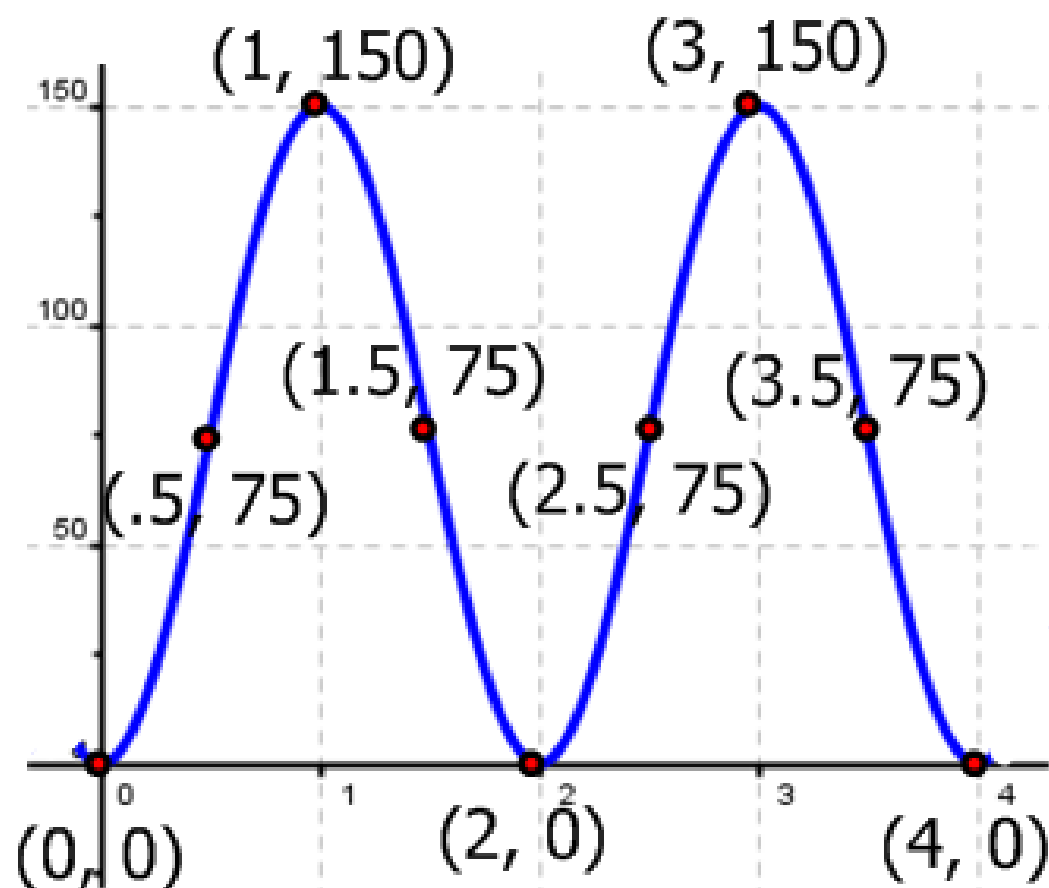
After 3 min, you are
150 ft above ground.

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The Wonder Wheel:



b.) What is the Domain of f ?



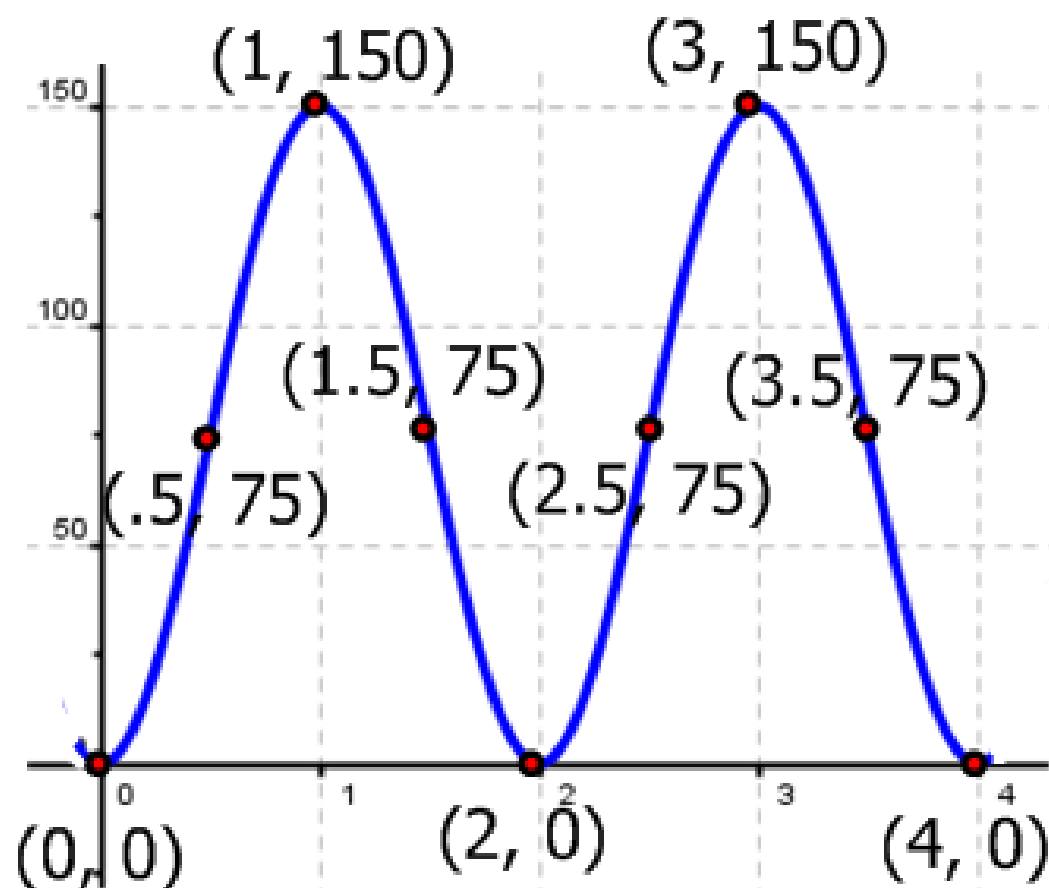
$$D: \{x \mid 0 \leq x \leq 4\}$$
$$[0, 4]$$

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The Wonder Wheel:



c.) What is the range of f ?



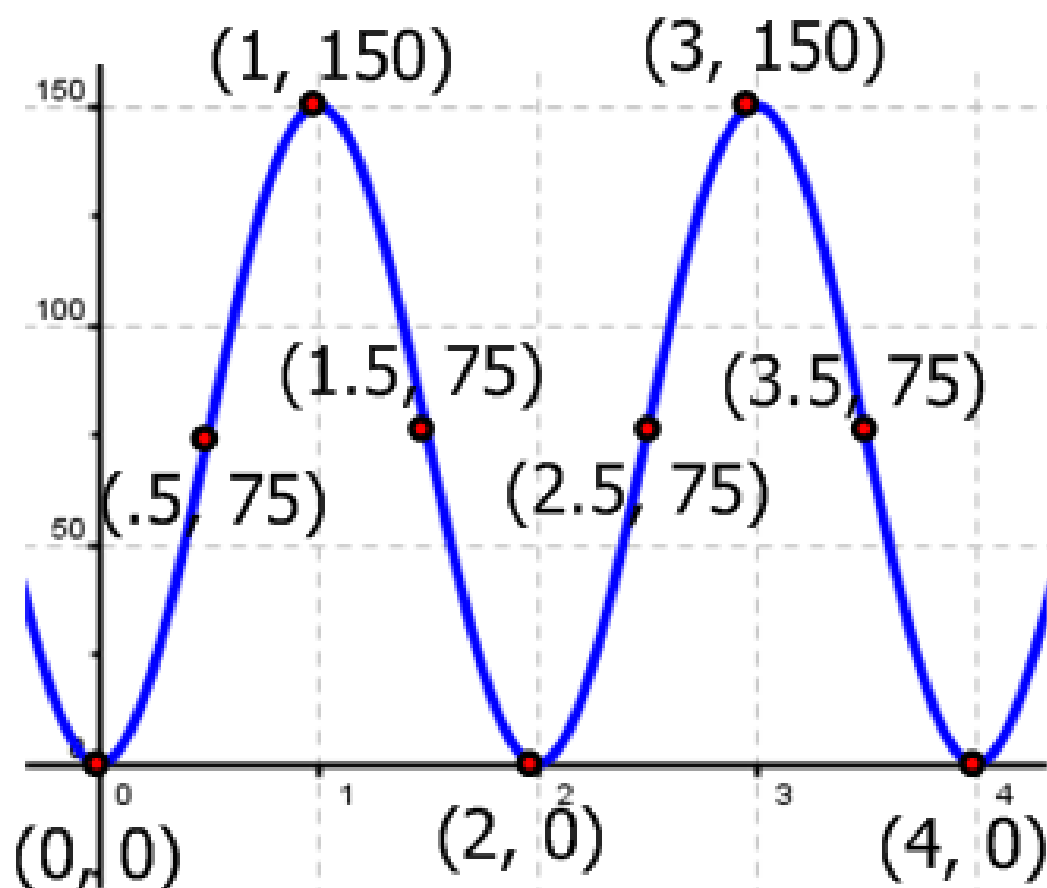
$$R: \{y \mid 0 \leq y \leq 150\}$$
$$[0, 150]$$

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The Wonder Wheel:



d.) List the Intercepts.



X-int: $(0, 0)$, $(2, 0)$, $(4, 0)$

y-int: $(0, 0)$

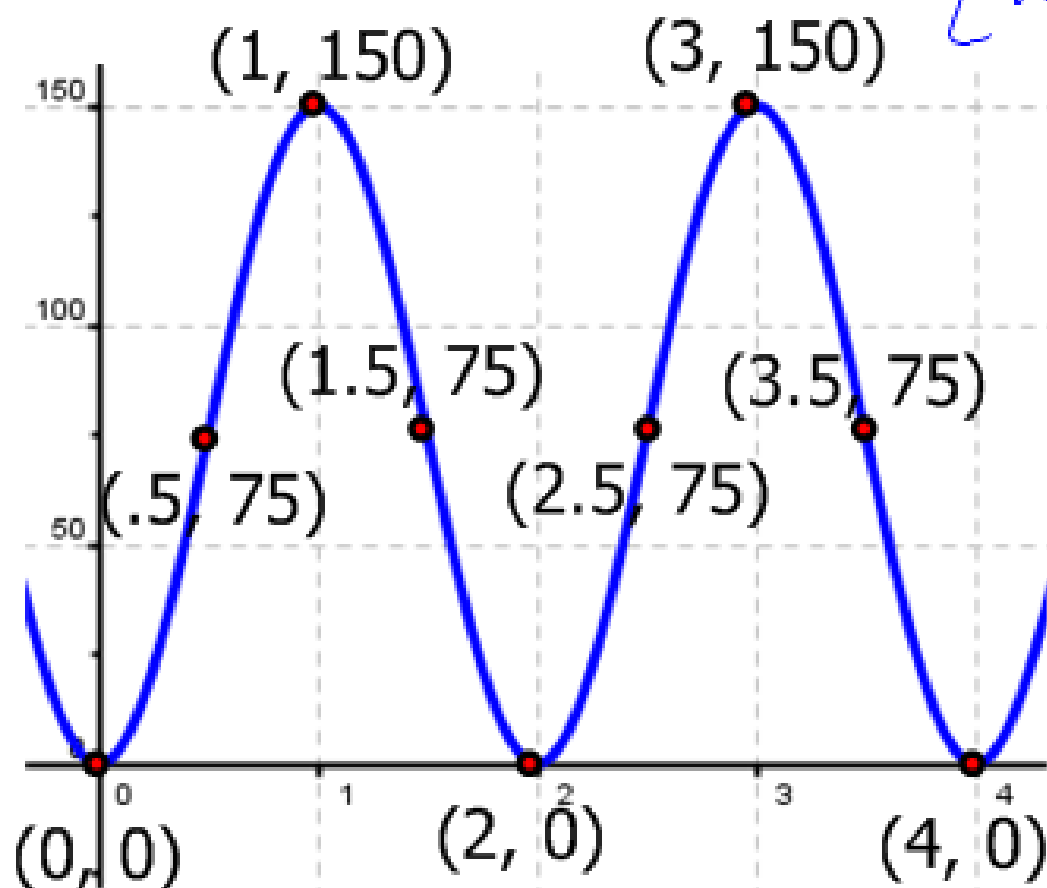
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The Wonder Wheel:



e.) For what values of x does $f(x) = 75$?

That is, Solve $f(x) = 75$.



$$\{x \mid y = 75\} = \{.5, 1.5, 2.5, 3.5\}$$

$$(.5, 75), (1.5, 75), \dots$$

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Obtain information from a graph of a function:

Example: Consider the function $f(x) = 2x - 5$.

a.) Is the point $(3, -1)$ on the graph of the function?

$$\begin{array}{l} -1 \stackrel{?}{=} 2(3) - 5 \\ -1 \stackrel{?}{=} 6 - 5 \end{array} \rightarrow -1 \neq 1$$

NO

b.) If $x = 1$, what is $f(x)$? What point is on the graph of the function?

$$f(1) = 2(1) - 5$$

$$f(1) = -3$$

$(1, -3)$

c.) If $f(x) = 3$, what is x ? What point is on the graph of the function?

$$\begin{array}{r} 3 = 2x - 5 \\ +5 \quad +5 \\ \hline 8 = 2x \end{array}$$

$$\frac{8}{2} = \frac{2x}{2}$$

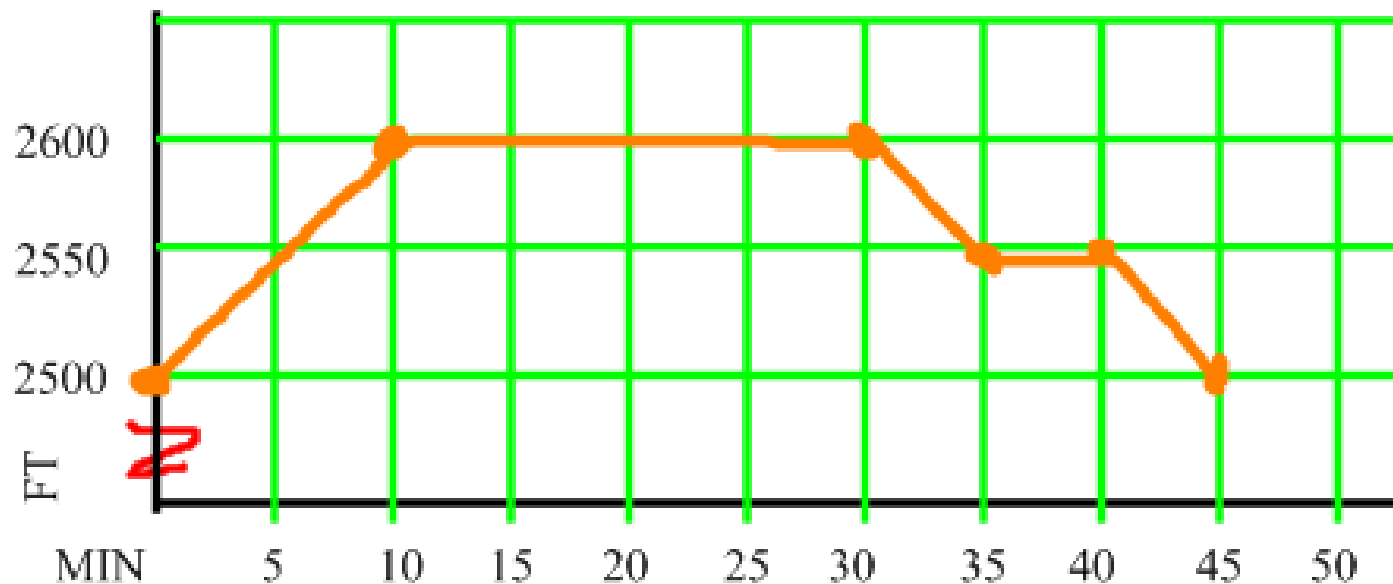
$$x = 4$$

$(4, 3)$

Interpret Graphs of Functions

Visually represent the following description.

Chris and Sarah went hiking in the Great Smoky Mountains starting at a height of 2500 ft. They began by walking up an 100-foot hill for 10 minutes. They walked on level ground for 20 minutes and then hiked down a 50-ft slope for 5 minutes. After 5 minutes of walking on level ground, they descended for 5 minutes down another hill until they were back at their starting elevation. Draw a graph of Chris and Sarah's elevation as a function of time.



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Can you?

Homework: (22 problems)

Pg. 174: 1-8 all, 11-33 odds, 39, 43