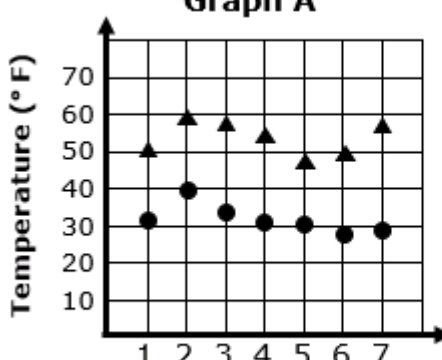
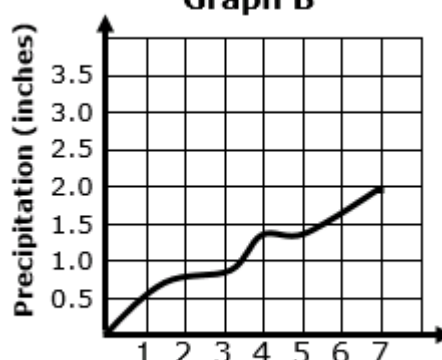


<p>Task Model 1</p> <p>Response Type: Multiple Choice, multiple correct response</p> <p>DOK Level 1</p> <p>F-IF.1 Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then $f(x)$ denotes the output of f corresponding to the input x. The graph of f is the graph of the equation $y = f(x)$.</p> <p>Evidence Required: 1. The student understands that a function from one set (the domain) to another set (the range) assigns to each element of the domain exactly one element of the range (e.g., distinguish between functions and non-functions).</p> <p>Tools: Calculator</p> <p>Version 3 Update: TM1a retired and revised TM1b.</p>	<p>Prompt Features: Distinguish between functions and non-functions based on recognizing that each element of the domain maps to exactly one element of the range.</p> <p>Stimulus Guidelines: The student is prompted to select which of a set of relations represented with equations determines one variable as a function of the other variable. Equations should be based on equations that students are familiar with in their work in algebra and coordinate geometry.</p> <p>TM1b Stimulus: The student is presented with a set of equations representing a variety of functions and non-functions. Equations may be linear, quadratic, polynomials, or absolute value. Students may graph or perform algebraic manipulations to check.</p> <p>Example Stem: The equation of any line in the coordinate plane can be written in the form $Ax + By = C$ where A, B, and C are real numbers. Select all of the equations below that define y as a function of x.</p> <p>A. $3x - 4y = -2$ B. $-9x + 0y = 78$ C. $0x + 56y = -11$ D. $-12x - 85y = 0$</p> <p>Rubric: (1 point) The student correctly selects all options that represent y as a function of x (e.g., A, C, D).</p> <p>Response Type: Multiple Choice, multiple correct response</p>
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<p>Task Model 1</p> <p>Response Type: Multiple Choice, multiple correct response</p> <p>DOK Level 2</p> <p>F-IF.A.1 Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then $f(x)$ denotes the output of f corresponding to the input x. The graph of f is the graph of the equation $y = f(x)$.</p> <p>Evidence Required: 1. The student understands that a function from one set (the domain) to another set (the range) assigns to each element of the domain exactly one element of the range (e.g., distinguish between functions and non-functions).</p> <p>Tools: Calculator</p> <p>Version 3 Update: New example stem 1 added to TM1c.</p>	<p>Prompt Features: Distinguish between functions and non-functions based on recognizing that each element of the domain maps to exactly one element of the range.</p> <p>Stimulus Guidelines: The student is prompted to select which statements are true or false, given the domain and range of a function.</p> <ul style="list-style-type: none"> • There should be no fewer than four and no more than six answer choices. • Item difficulty can be adjusted by varying the information about the domain and range of the function. <p>TM1c Stimulus: The student is presented with the domain and range of a function $f(x)$, as well as two given values of the function.</p> <p>Example Stem 1: The height in meters, h, of a model rocket above the ground is given t seconds after launch by the equation</p> $h = -5t^2 + 40t$ <p>where $0 \leq t \leq 8$ and $0 \leq h(t) \leq 80$</p> <p>Select all of the statements below that are true.</p> <p>A. $h(0) = 0$ B. $h(10) = -100$ C. The height of the rocket is 0 meters after 8 seconds from the launch. D. The rocket reaches a height of 320 feet.</p> <p>Example Stem 2: A function, f, has domain $-10 \leq x \leq 20$ and range $-40 \leq f(x) \leq -10$.</p> $f(1) = -13$ $f(-10) = -40$ <p>Select each statement that must be false about $f(x)$.</p> <p>A. $f(1) = 13$ B. $f(-9) = 88$ C. $f(5) = -40$ D. $f(0) = 0$ E. $f(-15) = -20$</p> <p>Rubric: (1 point) The student correctly selects all valid options based on the stem (e.g., A, C; A, B, D, E).</p> <p>Response Type: Multiple Choice, multiple correct response</p>
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<p>Task Model 1</p> <p>Response Type: Matching Table</p> <p>DOK Level 1</p> <p>F-IF.1 Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then $f(x)$ denotes the output of f corresponding to the input x. The graph of f is the graph of the equation $y = f(x)$.</p> <p>Evidence Required: 1. The student understands that a function from one set (the domain) to another set (the range) assigns to each element of the domain exactly one element of the range (e.g., distinguish between functions and non-functions).</p> <p>Tools: Calculator</p>	<p>Prompt Features: Distinguish between functions and non-functions based on recognizing that each element of the domain maps to exactly one element of the range.</p> <p>Stimulus Guidelines: the student is presented with several data tables and prompted to select which might represent functions.</p> <ul style="list-style-type: none"> The tables should contain no fewer than four and no more than six pairs of data values. Item difficulty can be adjusted by varying the size of the tables and the complexity of the data in the tables. <p>TM1d Stimulus: The student is presented with three or four data tables.</p> <p>Example Stem: Some students are studying graphs of functions $y = f(x)$ and other equations. Each table contains some points on a particular graph. Decide whether each set of points might be on the graph of a function or cannot be on the graph of a function.</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th style="width: 60%;"></th> <th style="width: 20%;">Yes These points might be</th> <th style="width: 20%;">No These points cannot be</th> </tr> </thead> <tbody> <tr> <td style="text-align: left; padding: 5px;">A. <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr><td>x</td><td>0</td><td>1</td><td>1</td><td>4</td><td>4</td></tr> <tr><td>y</td><td>0</td><td>3</td><td>4</td><td>3</td><td>0</td></tr> </table> </td> <td></td> <td></td> </tr> <tr> <td style="text-align: left; padding: 5px;">B. <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr><td>x</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td></tr> <tr><td>y</td><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td></tr> </table> </td> <td></td> <td></td> </tr> <tr> <td style="text-align: left; padding: 5px;">C. <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr><td>x</td><td>-2</td><td>0</td><td>1</td><td>3</td><td>4</td></tr> <tr><td>y</td><td>3</td><td>3</td><td>3</td><td>3</td><td>3</td></tr> </table> </td> <td></td> <td></td> </tr> </tbody> </table> <p>Rubric: (1 point) The student correctly identifies the true statement (e.g. NYY).</p> <p>Response Type: Matching Table</p>		Yes These points might be	No These points cannot be	A. <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr><td>x</td><td>0</td><td>1</td><td>1</td><td>4</td><td>4</td></tr> <tr><td>y</td><td>0</td><td>3</td><td>4</td><td>3</td><td>0</td></tr> </table>	x	0	1	1	4	4	y	0	3	4	3	0			B. <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr><td>x</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td></tr> <tr><td>y</td><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td></tr> </table>	x	0	1	2	3	4	y	0	1	0	1	0			C. <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr><td>x</td><td>-2</td><td>0</td><td>1</td><td>3</td><td>4</td></tr> <tr><td>y</td><td>3</td><td>3</td><td>3</td><td>3</td><td>3</td></tr> </table>	x	-2	0	1	3	4	y	3	3	3	3	3		
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<p>Task Model 1</p> <p>Response Type: Matching Table</p> <p>DOK Level 2</p> <p>F-IF.A.1 Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then $f(x)$ denotes the output of f corresponding to the input x. The graph of f is the graph of the equation $y = f(x)$.</p> <p>Evidence Required: 1. The student understands that a function from one set (the domain) to another set (the range) assigns to each element of the domain exactly one element of the range (e.g., distinguish between functions and non-functions).</p> <p>Tools: Calculator</p> <p>Version 3 Update: Added new TM1e, TM1f, and TM1g.</p>	<p>Prompt Features: Distinguish between functions and non-functions based on recognizing that each element of the domain maps to exactly one element of the range.</p> <p>Stimulus Guidelines: The student is presented with a graph in a real-world or mathematical context and asked if it represents the graph of a function.</p> <ul style="list-style-type: none"> • Graphs throughout should be properly identified [e.g., $y = f(x)$]. • Graph may be scatterplots, linear, quadratic, rational, or piece-wise functions. • Item difficulty can be adjusted by varying the type of functions and non-functions represented by the graphs. <p>TM1e Stimulus: The student is presented with a graph, and asked whether it represents the graph of a function.</p> <p>Example Stem: The graphs below show different information about the weather in a large city in the U.S. for one week in May.</p> <div style="text-align: center;"> <p>Graph A</p>  <p>Temperature ($^{\circ}$F)</p> <p>High Temperature ▲ Low Temperature ●</p> <p>1 2 3 4 5 6 7 First 7 Days of May</p> </div> <p>A.</p> <div style="text-align: center;"> <p>Graph B</p>  <p>Precipitation (inches)</p> <p>1 2 3 4 5 6 7 First 7 Days of May</p> </div> <p>B.</p>
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Task Model 1

Response Type:
Matching Table

DOK Level 2

F-IF.A.1

Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then $f(x)$ denotes the output of f corresponding to the input x . The graph of f is the graph of the equation $y = f(x)$.

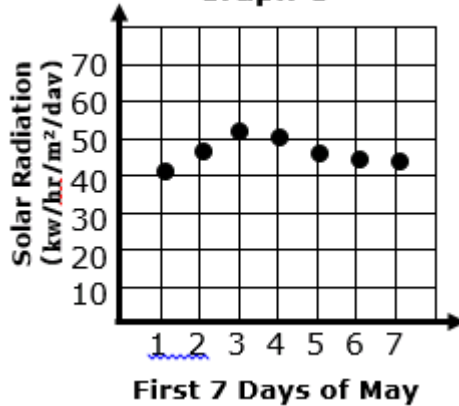
Evidence Required:

1. The student understands that a function from one set (the domain) to another set (the range) assigns to each element of the domain exactly one element of the range (e.g., distinguish between functions and non-functions).

Tools: Calculator

Version 3 Update:
Added new TM1e, TM1f, and TM1g.

Graph C



C.

Determine whether each graph represents the given quantity as a function of time.

	True	False
Graph A represents temperature as a function of time.		
Graph B represents amount of accumulated precipitation as a function of time.		
Graph C represents the solar intensity as a function of time.		

Rubric: (1 point) The student chooses the correct responses (FTT).

Response Type: Matching Table

Task Model 1

Response Type:
Multiple Choice,
single correct
response

DOK Level 1

F-IF.A.1

Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then $f(x)$ denotes the output of f corresponding to the input x . The graph of f is the graph of the equation $y = f(x)$.

Evidence Required:

1. The student understands that a function from one set (the domain) to another set (the range) assigns to each element of the domain exactly one element of the range (e.g., distinguish between functions and non-functions).

Tools: Calculator

Version 3 Update:
Added new TM1e,
TM1f, and TM1g.

Prompt Features: Distinguish between functions and non-functions based on recognizing that each element of the domain maps to exactly one element of the range.

Stimulus Guidelines: The student is presented with a graph in a real-world or mathematical context and asked if it represents the graph of a function.

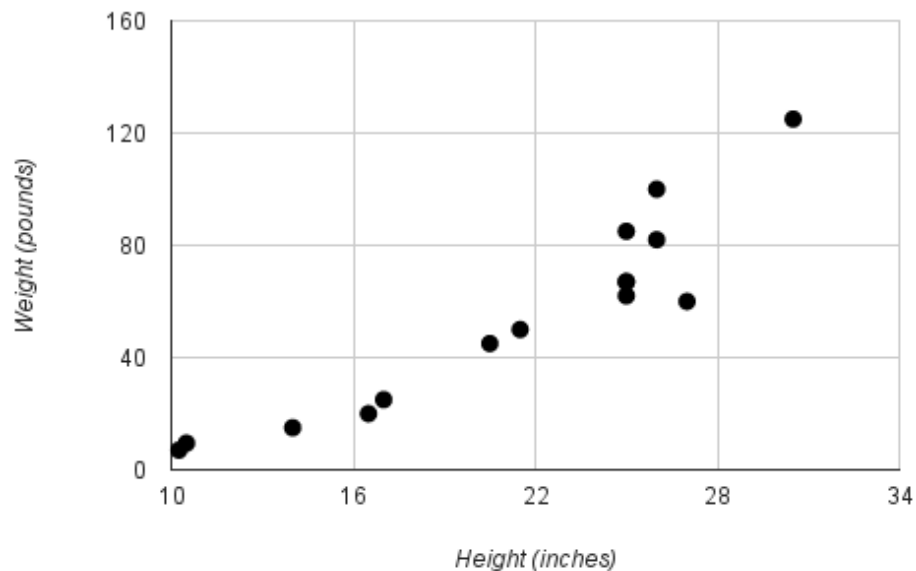
- Graphs throughout should be properly identified [e.g., $y = f(x)$].
- Graph may be scatterplots, linear, quadratic, rational, or piece-wise functions.
- Item difficulty can be adjusted by varying the type of functions and non-functions represented by the graphs.

TM1f

Stimulus: The student is presented with a graph, and asked whether it represents the graph of a function.

Example Stem 1: The scatterplot represents the relationship between the average height and weight of 15 different dog breeds.

Average Height and Weight of 15 Dog Breeds



Height (inches)	10.25	27	25	25	17	21.5	16.5	25	10.5	26	25	20.5	14	26	30.5
Weight (pounds)	7	60	85	62	25	50	20	67	9.5	100	67	45	15	82	125

Task Model 1

Response Type:
Multiple Choice,
single correct
response

DOK Level 1

F-IF.A.1

Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then $f(x)$ denotes the output of f corresponding to the input x . The graph of f is the graph of the equation $y = f(x)$.

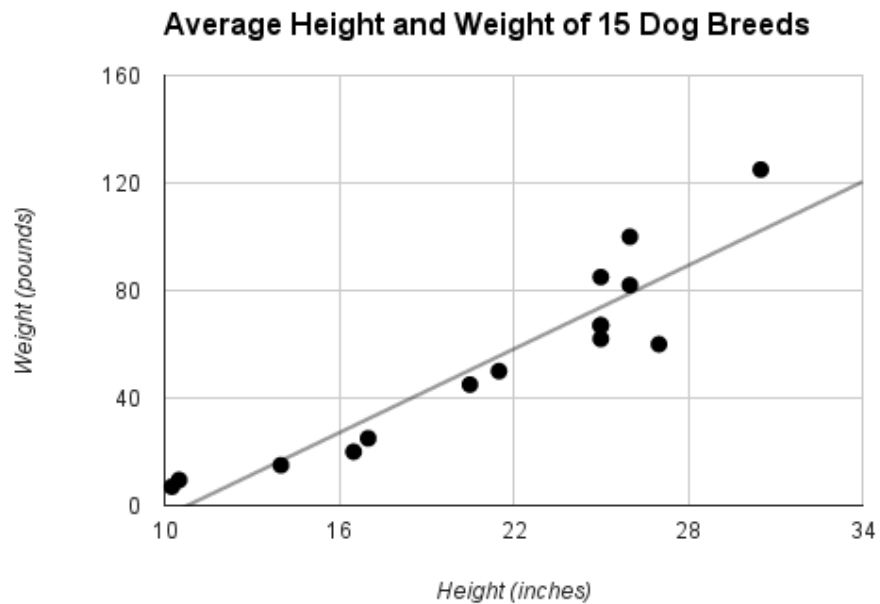
Evidence Required:

1. The student understands that a function from one set (the domain) to another set (the range) assigns to each element of the domain exactly one element of the range (e.g., distinguish between functions and non-functions).

Tools: Calculator

Version 3 Update:
Added new TM1e,
TM1f, and TM1g.

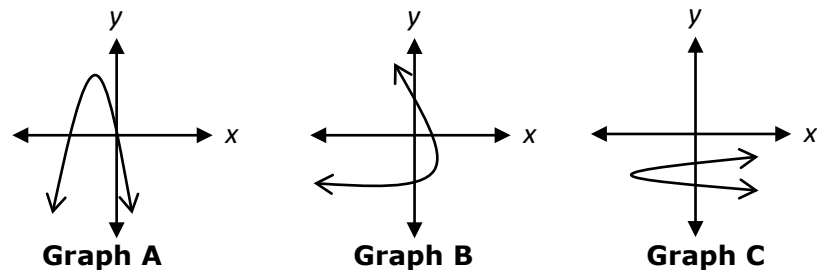
The second graph shows the same data with a line of best fit.



Which statement best describes the relationship displayed by the scatterplot and line of best fit?

- A. Both the scatterplot and the line of best fit represent a function.
- B. The scatterplot represents a function but the line of best fit does not.
- C. The line of best fit represents a function but the scatterplot does not.
- D. Neither represents a function.

Example Stem 2: Three different parabolas, each defined by a different equation, are shown in the coordinate plane.



Which graph represents y as a function of x ?

- A. Graph A
- B. Graph B
- C. Graph C
- D. None of the graphs

Rubric: (1 point) The student chooses the correct response (e.g., C, A).

Response Type: Multiple Choice, single correct response

<p>Task Model 1</p> <p>Response Type: Matching Table</p> <p>DOK Level 1</p> <p>F-IF.A.1 Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then $f(x)$ denotes the output of f corresponding to the input x. The graph of f is the graph of the equation $y = f(x)$.</p> <p>Evidence Required: 1. The student understands that a function from one set (the domain) to another set (the range) assigns to each element of the domain exactly one element of the range (e.g., distinguish between functions and non-functions).</p> <p>Tools: Calculator</p> <p>Version 3 Update: Added new TM1e, TM1f, and TM1g.</p>	<p>Prompt Features: Distinguish between functions and non-functions based on recognizing that each element of the domain maps to exactly one element of the range.</p> <p>TM1g Stimulus: The student is prompted to select which of a set of relations represented with equations determines one variable as a function of the other variable.</p> <p>Example Stem: The height in meters, h, of a model rocket above the ground is given t seconds after launch by the equation</p> $h = -5t^2 + 40t$ <p>Given this information, indicate whether each statement is true or false.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 80%;"></th> <th style="width: 10%; text-align: center;">True</th> <th style="width: 10%; text-align: center;">False</th> </tr> </thead> <tbody> <tr> <td>The height of the rocket is a function of time.</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>The time since launch is a function of the height.</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> </tbody> </table> <p>Rubric: (1 point) The student chooses the correct responses (T, F).</p> <p>Response Type: Matching Table</p>		True	False	The height of the rocket is a function of time.	<input type="checkbox"/>	<input type="checkbox"/>	The time since launch is a function of the height.	<input type="checkbox"/>	<input type="checkbox"/>
	True	False								
The height of the rocket is a function of time.	<input type="checkbox"/>	<input type="checkbox"/>								
The time since launch is a function of the height.	<input type="checkbox"/>	<input type="checkbox"/>								

Task Model 3

Response Type:
Graphing

DOK Level 2

F-IF.1

Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then $f(x)$ denotes the output of f corresponding to the input x . The graph of f is the graph of the equation $y = f(x)$.

Evidence Required:

3. The student understands that the graph of f is the graph of the equation $y = f(x)$.

Tools: None

Version 3 Update:

Retired TM2 and Evidence Required statement 2.

Accessibility Note:

Graphing items are not currently able to be Brailled. Minimize the number of items developed to this TM.

Prompt Features: The student understands that the graph of f is the graph of the equation $y = f(x)$.

Stimulus Guidelines:

- Difficulty level can be altered by varying the type of functions graphed.

TM3

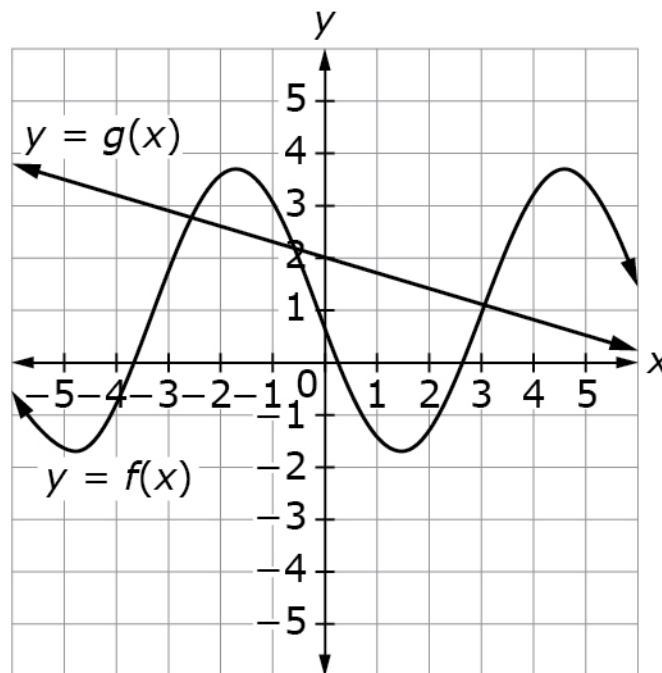
Stimulus: The student is presented with one or two functions and directed to use the "Add Point" tool to plot points that lie on those functions. If two functions are used, the item may be worth two points.

Example Stem:

The graphs of $y = g(x)$ and $y = f(x)$ are shown.

Use the "Add Point" tool to add a point that will satisfy each given condition.

- A point on the graph of g where $x=0$.
- A point on the graph of g where $f(x) > g(x)$.
- A point on the graph of f where $f(x) = 0$.



Task Model 3

Response Type:
Graphing

DOK Level 2

F-IF.1

Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then $f(x)$ denotes the output of f corresponding to the input x . The graph of f is the graph of the equation $y = f(x)$.

Evidence Required:

3. The student understands that the graph of f is the graph of the equation $y = f(x)$.

Tools: None

Version 3 Update:

Retired TM2 and Evidence Required statement 2.

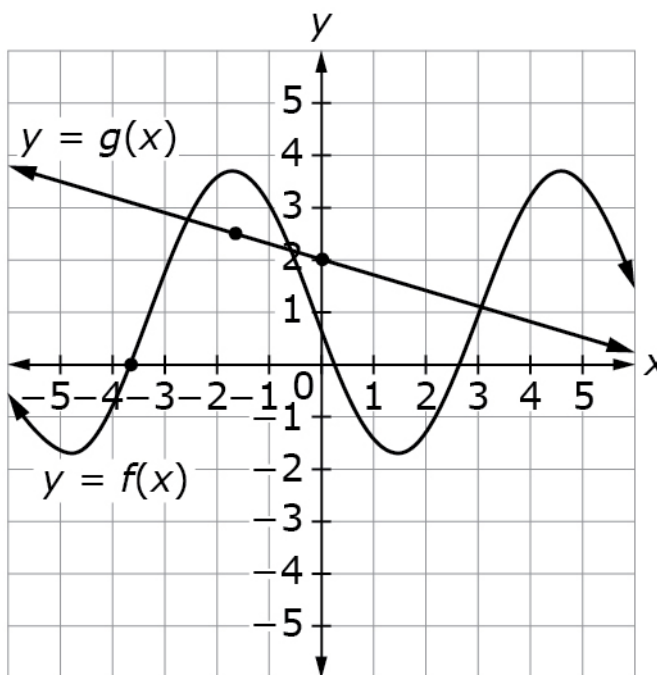
Accessibility Note:

Graphing items are not currently able to be Brailled. Minimize the number of items developed to this TM.

Rubric:

(2 points) The student correctly plots points defined by the conditions (e.g., A: The y -intercept of g ; B: Any point on the graph of g sitting under the graph of f ; C: Any of the three points where the graph of f crosses the x -axis).

(1 point) The student correctly plots two of the three points defined by the conditions.



Response Type: Graphing

Source: Adapted from Illustrative Mathematics

<p>Task Model 4</p> <p>Response Type: Multiple Choice, single correct response</p> <p>DOK Level 1</p> <p>F-IF.3 Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. <i>For example, the Fibonacci sequence is defined recursively by $f(0) = f(1) = 1, f(n+1) = f(n) + f(n-1)$ for $n \geq 1$.</i></p> <p>Evidence Required: 4. The student recognizes that sequences are functions whose domain is a subset of the integers.</p> <p>Tools: None</p> <p>Version 3 Update: Revised example stem for TM4.</p>	<p>Prompt Features: The student recognizes that sequences are functions whose domain is a subset of the integers.</p> <p>Stimulus Guidelines:</p> <ul style="list-style-type: none"> The domain of each function should be a subset of integers. Difficulty level can be altered by varying the complexity of the sequence. <p>TM4</p> <p>Stimulus: The student is presented with five terms of a sequence.</p> <p>Example Stem: Consider a sequence whose first five terms are 6, 12, 24, 48, 96.</p> <p>Select the function, with domain $n = \{1, 2, 3, 4, 5\}$, that defines this sequence.</p> <p>A. $f(n) = 6n$ B. $f(n) = 6(n - 1)$ C. $f(n) = 6n^2$ D. $f(n) = 6(2)^{n-1}$</p> <p>Rubric: (1 point) The student correctly identifies the equation of the function defined by the sequence (e.g., D).</p> <p>Response Type: Multiple Choice, single correct response</p>
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