Standard #: MAFS.912.F-IF.2.4

This document was generated on CPALMS - www.cpalms.org

For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. *Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.* ★

Subject Area: Mathematics

Grade: 912

Domain-Subdomain: Functions: Interpreting Functions

Cluster: Level 2: Basic Application of Skills & Concepts

Cluster: Interpret functions that arise in applications in terms of the context. (Algebra 1 - Major Cluster) (Algebra 2 - Major Cluster) -
Clusters should not be sorted from Major to Supporting and then taught in that order. To do so would strip the coherence of the mathematical ideas and miss the opportunity to enhance the major work of the grade with the supporting clusters.

Date Adopted or Revised: 02/14

Content Complexity Rating: Level 2: Basic Application of Skills & Concepts - More Information

Date of Last Rating: 02/14

Status: State Board Approved

Assessed: Yes

TEST ITEM SPECIFICATIONS

Item Type(s): This benchmark may be assessed using: GRID item(s)

Also assesses:
MAFS.912.F-IF.3.9

Assessment Limits :
Functions represented algebraically are limited to linear, quadratic, or exponential.

Functions may be represented using tables, graphs or verbally.

Functions represented using these representations are not limited to linear, quadratic or exponential.

Functions may have closed domains.

Functions may be discontinuous.

Items may not require the student to use or know interval notation.

Key features include x-intercepts, y-intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; and end behavior.

Calculator :
Neutral

Clarification :
Students will determine and relate the key features of a function within a real-world context by examining the function's table.

Students will determine and relate the key features of a function within a real-world context by examining the function's graph.

Students will use a given verbal description of the relationship between two quantities to label key features of a graph of a function that model the relationship.

Students will differentiate between different types of functions using a variety of descriptors (e.g., graphically, verbally, numerically, and algebraically).

Students will compare and contrast properties of two functions using a variety of function representations (e.g., algebraic, graphic, numeric in tables, or verbal descriptions).

Stimulus Attributes :
For F-IF.2.4, items should be set in a real-world context.

For F-IF.3.9, items may be set in a real-world or mathematical context.

Items may use verbal descriptions of functions.

Items must use function notation.

Response Attributes :
For F-IF.2.4, items may require the student to apply the basic modeling cycle.

Items may require the student to write intervals using inequalities.

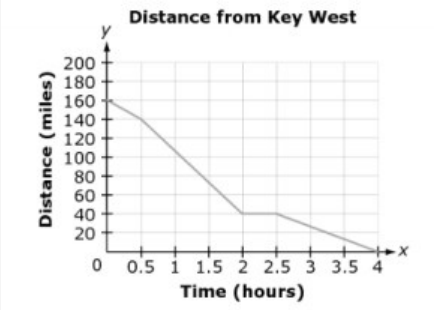
Items may require the student to choose an appropriate level of accuracy.

Items may require the student to choose and interpret the scale in a graph.

Items may require the student to choose and interpret units.

SAMPLE TEST ITEMS (1)

Test Item #: Sample Item 1
Question:
Kim is driving from Miami to Key West. The graph shows her distance from Key West.



During what interval is Kim driving the fastest? Drag numbers to the boxes to complete the inequality.

Difficulty: N/A
Type: GRID: Graphic Response Item Display

Related Courses

Course Number	Course Title
1200310:	Algebra 1 (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
1200320:	Algebra 1 Honors (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
1200330:	Algebra 2 (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
1200340:	Algebra 2 Honors (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
1200370:	Algebra 1-A (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
1200380:	Algebra 1-B (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
1200400:	Intensive Mathematics (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
1206330:	Analytic Geometry (Specifically in versions: 2014 - 2015 (course terminated))
2000350:	Anatomy and Physiology (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
2000360:	Anatomy and Physiology Honors (Specifically in versions: 2014 - 2015, 2015 and beyond (current))

2020910:	Astronomy Solar/Galactic Honors (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
2000320:	Biology 1 Honors (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
2000330:	Biology 2 Honors (Specifically in versions: 2014 - 2015, 2015 - 2018, 2018 and beyond (current))
2003340:	Chemistry 1 (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
2003350:	Chemistry 1 Honors (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
2003360:	Chemistry 2 (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
2001320:	Earth/Space Science Honors (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
2001340:	Environmental Science (Specifically in versions: 2015 and beyond (current))
2000440:	Genetics (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
2002410:	Integrated Science 1 Honors (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
2002430:	Integrated Science 2 Honors (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
2002440:	Integrated Science 3 (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
2002450:	Integrated Science 3 Honors (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
2002500:	Marine Science 1 (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
2002510:	Marine Science 1 Honors (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
2002520:	Marine Science 2 (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
2002530:	Marine Science 2 Honors (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
2003400:	Nuclear Radiation (Specifically in versions: 2014 - 2015, 2015 - 2018 (course terminated))
2020710:	Nuclear Radiation Honors (formerly 202071A) (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
2003320:	Physical Science Honors (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
2003380:	Physics 1 (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
2003390:	Physics 1 Honors (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
2003410:	Physics 2 (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
2002540:	Solar Energy Honors (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
1200500:	Advanced Algebra with Financial Applications (Specifically in versions: 2014 - 2015 (course terminated))
1200410:	Mathematics for College Success (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
1200700:	Mathematics for College Readiness (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
7912070:	Access Liberal Arts Mathematics (Specifically in versions: 2014 - 2015, 2015 - 2018, 2018 - 2019, 2019 and beyond (current))
7912080:	Access Algebra 1A (Specifically in versions: 2014 - 2015, 2015 - 2018, 2018 - 2019, 2019 and beyond (current))
7912090:	Access Algebra 1B (Specifically in versions: 2014 - 2015, 2015 - 2018, 2018 - 2019, 2019 and beyond (current))
7920011:	Access Chemistry 1 (Specifically in versions: 2014 - 2015, 2015 - 2018, 2018 and beyond (current))
2000500:	Bioscience 1 Honors (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
2000510:	Bioscience 2 Honors (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
2002445:	Integrated Science 3 for Credit Recovery (Specifically in versions: 2014 - 2015, 2015 - 2020 (course terminated))
2003345:	Chemistry 1 for Credit Recovery (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
2003385:	Physics 1 for Credit Recovery (Specifically in versions: 2014 - 2015, 2015 - 2020 (course terminated))
1200315:	Algebra 1 for Credit Recovery (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
1200335:	Algebra 2 for Credit Recovery (Specifically in versions: 2014 - 2015, 2015 - 2019 (course terminated))
1200375:	Algebra 1-A for Credit Recovery (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
1200385:	Algebra 1-B for Credit Recovery (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
7912100:	Fundamental Algebraic Skills (Specifically in versions: 2013 - 2015, 2015 - 2017 (course terminated))
1207300:	Liberal Arts Mathematics 1 (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
7912075:	Access Algebra 1 (Specifically in versions: 2014 - 2015, 2015 - 2018, 2018 - 2019, 2019 and beyond (current))
2003836:	Florida's Preinternational Baccalaureate Physics 1 (Specifically in versions: 2015 and beyond (current))
2003838:	Florida's Preinternational Baccalaureate Physics 2 (Specifically in versions: 2015 and beyond (current))
7912095:	Access Algebra 2 (Specifically in versions: 2016 - 2018, 2018 - 2019, 2019 and beyond (current))
2001341:	Environmental Science Honors (Specifically in versions: 2016 and beyond (current))
1200387:	Financial Algebra (Specifically in versions: 2016 and beyond (current))

Related Access Points

Access Point

Access Points Number	Access Points Title
MAFS.912.F-IF.2.AP.4a:	Recognize and interpret the key features of a function.
MAFS.912.F-IF.2.AP.4b:	Select the graph that matches the description of the relationship between two quantities in the function.

Related Resources

Problem-Solving Task

Name	Description
As the Wheel Turns:	In this task, students use trigonometric functions to model the movement of a point around a wheel and, through space. Students also interpret features of graphs in terms of the given real-world context.
Average Cost:	This task asks students to find the average, write an equation, find the domain, and create a graph of the cost of producing DVDs.

How Is the Weather?:	This task can be used as a quick assessment to see if students can make sense of a graph in the context of a real world situation. Students also have to pay attention to the scale on the vertical axis to find the correct match. The first and third graphs look very similar at first glance, but the function values are very different since the scales on the vertical axes are very different. The task could also be used to generate a group discussion on interpreting functions given by graphs.
Logistic Growth Model, Abstract Version:	This task is for instructional purposes only and students should already be familiar with some specific examples of logistic growth functions. The goal of this task is to have students appreciate how different constants influence the shape of a graph.
Logistic Growth Model, Explicit Version:	This problem introduces a logistic growth model in the concrete settings of estimating the population of the U.S. The model gives a surprisingly accurate estimate and this should be contrasted with linear and exponential models.
Sum of Even and Odd:	Students explore and manipulate expressions based on the following statement: A function f defined for -a < x < a is even if f(-x)=f(x) and is odd if f(-x)=-f(x) when -a < x < a. In this task we assume f is defined on such an interval, which might be the full real line (i.e., a=8).
Telling a Story with Graphs:	In this task students are given graphs of quantities related to weather. The purpose of the task is to show that graphs are more than a collection of coordinate points; they can tell a story about the variables that are involved, and together they can paint a very complete picture of a situation, in this case the weather. Features in one graph, like maximum and minimum points, correspond to features in another graph. For example, on a rainy day, the solar radiation is very low, and the cumulative rainfall graph is increasing with a large slope.
The Canoe Trip, Variation 1:	The purpose of this task is to give students practice constructing functions that represent a quantity of interest in a context, and then interpreting features of the function in the light of the context. It can be used as either an assessment or a teaching task.
The Canoe Trip, Variation 2:	The primary purpose of this task is to lead students to a numerical and graphical understanding of the behavior of a rational function near a vertical asymptote, in terms of the expression defining the function.
Throwing Baseballs:	This task could be used for assessment or for practice. It allows students to compare characteristics of two quadratic functions that are each represented differently, one as the graph of a quadratic function and one written out algebraically. Specifically, students are asked to determine which function has the greatest maximum and the greatest non-negative root.
Warming and Cooling:	This task is meant to be a straight-forward assessment task of graph reading and interpreting skills. This task helps reinforce the idea that when a variable represents time, t = 0 is chosen as an arbitrary point in time and positive times are interpreted as times that happen after that.

Formative Assessment

Name	Description
Bike Race:	Students are asked to evaluate three verbal descriptions and to state why each does or does not match a given graph.
Elevation Along a Trail:	Students are asked to interpret key features of a graph (symmetry) in the context of a problem situation.
Surf's Up:	Students are given a table of functional values and asked to describe and interpret key features of the graph in the context of the problem.
Taxi Ride:	Students are asked to sketch a graph from a verbal description.
Uphill and Downhill:	Students are asked to interpret key features of a graph (intercepts and intervals over which the graph is increasing) in the context of a problem situation.

Perspectives Video: Expert

Name	Description
Birdsong Series: Mathematically Modeling Birdsong:	Richard Bertram discusses his mathematical modeling contribution to the Birdsong project that helps the progress of neuron and ion channel research.
Jumping Robots and Quadratics:	Jump to it and learn more about how quadratic equations are used in robot navigation problem solving!

Lesson Plan

Name	Description
Compacting Cardboard:	Students with investigate the amount of space that could be saved by flattening cardboard boxes. The analysis includes linear graphs and regression analysis along with discussions of slope and a direct variation phenomenon.
Cup-Activity: writing equations from data:	This is a great lab activity that allows students to develop a true understanding of slope as a rate of change. Students are active and involved and must use higher order thinking skills in order to answer questions. Students work through an activity, measuring heights of cups that are stacked. Students them determine a "rate of change - slope". Students are then asked to put this into slope-intercept form. The important part here is in their determining the y-intercept of the equation. Students then take this further and finally attempt to create a linear inequality to determine how many cups, stacked vertically, will fit under a table.
Exponential Graphing Using Technology:	This lesson is teacher/student directed for discovering and translating exponential functions using a graphing app. The lesson focuses on the translations from a parent graph and how changing the coefficient, base and exponent values relate to the transformation.
	This lesson is intended to help you assess how well students are able to:

Ferris Wheel:	• Model a periodic situation, the height of a person on a Ferris wheel, using trigonometric functions. • Interpret the constants *a, b, c* in the formula $h = a + b \cos ct$ in terms of the physical situation, where *h* is the height of the person above the ground and *t* is the elapsed time.
Functions and Everyday Situations:	This lesson unit is intended to help you assess how well students are able to articulate verbally the relationships between variables arising in everyday contexts, translate between everyday situations and sketch graphs of relationships between variables, interpret algebraic functions in terms of the contexts in which they arise and reflect on the domains of everyday functions and in particular whether they should be discrete or continuous.
How high is that railing, anyway?:	This is a short activity where students are able to determine the height of an elevated railing by using the equations associated with freefall. This lesson may also be appropriate for analyzing graphs related to position/velocity/acceleration versus time.
Parts and more Parts--Parabola Fun:	This is an entry lesson into quadratic functions and their shapes. Students see many real-life representations of parabolas. This lesson provides important vocabulary associated with quadratic functions and their graphs in an interactive manner. Students create a foldable and complete a worksheet using their foldable notes.
Representing Polynomials:	This lesson unit is intended to help you assess how well students are able to translate between graphs and algebraic representations of polynomials. In particular, this unit aims to help you identify and assist students who have difficulties in recognizing the connection between the zeros of polynomials when suitable factorizations are available, and graphs of the functions defined by polynomials as well as recognizing the connection between transformations of the graphs and transformations of the functions obtained by replacing $f(x)$ by $f(x + k)$, $f(x) + k$, $-f(x)$, $f(-x)$.
To The Limit:	"To The Limit" MEA has students identify several factors that can affect a population's growth. Students will examine photos to list limiting factors and discuss their impact on populations. As a group they will develop a solution to minimize the impact of pollution on fish population.
Transforming Quadratics - The basics:	This lesson introduces students to the graph of the quadratic parent function. It provides a note taking sheet for students to organize their learning of basic transformations to the parent function. There is a "FUN" cut and paste activity for students to match graphs with verbal descriptions and their equations.

Virtual Manipulative

Name	Description
Data Flyer:	Using this virtual manipulative, students are able to graph a function and a set of ordered pairs on the same coordinate plane. The constants, coefficients, and exponents can be adjusted using slider bars, so the student can explore the affect on the graph as the function parameters are changed. Students can also examine the deviation of the data from the function. This activity includes supplemental materials, including background information about the topics covered, a description of how to use the application, and exploration questions for use with the java applet.
Function Flyer:	In this online tool, students input a function to create a graph where the constants, coefficients, and exponents can be adjusted by slider bars. This tool allows students to explore graphs of functions and how adjusting the numbers in the function affect the graph. Using tabs at the top of the page you can also access supplemental materials, including background information about the topics covered, a description of how to use the application, and exploration questions for use with the java applet.
Graphing Lines:	Allows students access to a Cartesian Coordinate System where linear equations can be graphed and details of the line and the slope can be observed.
Slope Slider:	In this activity, students adjust slider bars which adjust the coefficients and constants of a linear function and examine how their changes affect the graph. The equation of the line can be in slope-intercept form or standard form. This activity allows students to explore linear equations, slopes, and y-intercepts and their visual representation on a graph. This activity includes supplemental materials, including background information about the topics covered, a description of how to use the application, and exploration questions for use with the java applet.

Perspectives Video: Professional/Enthusiast

Name	Description
Graphing Torque and Horsepower for Dyno-mite Racing:	SCCA race car drivers discuss how using a chassis dyno to graph horsepower and torque curves helps them maximize potential in their race cars.

Tutorial

Name	Description
Linear Functions:	In this tutorial, "Linear functions of the form f(x) = ax + b and the properties of their graphs are explored interactively using an applet." The applet allows students to manipulate variables to discover the changes in intercepts and slope of the graphed line. There are six questions for students to answer, exploring the applet and observing changes. The questions' answers are included on this site. Additionally, a tutorial for graphing linear functions by hand is included.

Assessment

Name	Description
Sample 1 - High School Algebra 2 State Interim Assessment:	This is a State Interim Assessment for 9th-12th grades.
Sample 2 - High School Algebra 1 State Interim Assessment:	This is a State Interim Assessment for 9th-12th grades.
Sample 2 - High School Algebra 2 State Interim	This is a State Interim Assessment for 9th-12th grades.

Assessment:	
Sample 4 - High School Algebra 1 State Interim Assessment:	This is a State Interim Assessment for 9th-12th grades.

Unit/Lesson Sequence

Name	Description
Sample Algebra 1 Curriculum Plan Using CMAP:	This sample Algebra 1 CMAP is a fully customizable resource and curriculum-planning tool that provides a framework for the Algebra 1 Course. The units and standards are customizable and the CMAP allows instructors to add lessons, worksheets, and other resources as needed. This CMAP also includes rows that automatically filter and display Math Formative Assessments System tasks, E-Learning Original Student Tutorials and Perspectives Videos that are aligned to the standards, available on CPALMS. Learn more about the sample Algebra 1 CMAP, its features and customizability by watching the following video: Using this CMAP To view an introduction on the CMAP tool, please click here. To view the CMAP, click on the "Open Resource Page" button above; be sure you are logged in to your iCPALMS account. To use this CMAP, click on the "Clone" button once the CMAP opens in the "Open Resource Page." Once the CMAP is cloned, you will be able to see it as a class inside your iCPALMS My Planner (CMAPs) app. To access your My Planner App and the cloned CMAP, click on the iCPALMS tab in the top menu. All CMAP tutorials can be found within the iCPALMS Planner App or at the following URL: http://www.cpalms.org/support/tutorials_and_informational_videos.aspx

Student Resources

Name	Description
As the Wheel Turns:	In this task, students use trigonometric functions to model the movement of a point around a wheel and, through space. Students also interpret features of graphs in terms of the given real-world context.
Average Cost:	This task asks students to find the average, write an equation, find the domain, and create a graph of the cost of producing DVDs.
Data Flyer:	Using this virtual manipulative, students are able to graph a function and a set of ordered pairs on the same coordinate plane. The constants, coefficients, and exponents can be adjusted using slider bars, so the student can explore the affect on the graph as the function parameters are changed. Students can also examine the deviation of the data from the function. This activity includes supplemental materials, including background information about the topics covered, a description of how to use the application, and exploration questions for use with the java applet.
Function Flyer:	In this online tool, students input a function to create a graph where the constants, coefficients, and exponents can be adjusted by slider bars. This tool allows students to explore graphs of functions and how adjusting the numbers in the function affect the graph. Using tabs at the top of the page you can also access supplemental materials, including background information about the topics covered, a description of how to use the application, and exploration questions for use with the java applet.
Graphing Lines:	Allows students access to a Cartesian Coordinate System where linear equations can be graphed and details of the line and the slope can be observed.
How Is the Weather?:	This task can be used as a quick assessment to see if students can make sense of a graph in the context of a real world situation. Students also have to pay attention to the scale on the vertical axis to find the correct match. The first and third graphs look very similar at first glance, but the function values are very different since the scales on the vertical axes are very different. The task could also be used to generate a group discussion on interpreting functions given by graphs.
Jumping Robots and Quadratics:	Jump to it and learn more about how quadratic equations are used in robot navigation problem solving!

Logistic Growth Model, Abstract Version:	This task is for instructional purposes only and students should already be familiar with some specific examples of logistic growth functions. The goal of this task is to have students appreciate how different constants influence the shape of a graph.
Logistic Growth Model, Explicit Version:	This problem introduces a logistic growth model in the concrete settings of estimating the population of the U.S. The model gives a surprisingly accurate estimate and this should be contrasted with linear and exponential models.
Slope Slider:	In this activity, students adjust slider bars which adjust the coefficients and constants of a linear function and examine how their changes affect the graph. The equation of the line can be in slope-intercept form or standard form. This activity allows students to explore linear equations, slopes, and y-intercepts and their visual representation on a graph. This activity includes supplemental materials, including background information about the topics covered, a description of how to use the application, and exploration questions for use with the java applet.
Sum of Even and Odd:	Students explore and manipulate expressions based on the following statement: A function f defined for -a < x < a is even if f(-x)=f(x) and is odd if f(-x)=-f(x) when -a < x < a. In this task we assume f is defined on such an interval, which might be the full real line (i.e., a=8).
Telling a Story with Graphs:	In this task students are given graphs of quantities related to weather. The purpose of the task is to show that graphs are more than a collection of coordinate points; they can tell a story about the variables that are involved, and together they can paint a very complete picture of a situation, in this case the weather. Features in one graph, like maximum and minimum points, correspond to features in another graph. For example, on a rainy day, the solar radiation is very low, and the cumulative rainfall graph is increasing with a large slope.
The Canoe Trip, Variation 1:	The purpose of this task is to give students practice constructing functions that represent a quantity of interest in a context, and then interpreting features of the function in the light of the context. It can be used as either an assessment or a teaching task.
The Canoe Trip, Variation 2:	The primary purpose of this task is to lead students to a numerical and graphical understanding of the behavior of a rational function near a vertical asymptote, in terms of the expression defining the function.
Throwing Baseballs:	This task could be used for assessment or for practice. It allows students to compare characteristics of two quadratic functions that are each represented differently, one as the graph of a quadratic function and one written out algebraically. Specifically, students are asked to determine which function has the greatest maximum and the greatest non-negative root.
Warming and Cooling:	This task is meant to be a straight-forward assessment task of graph reading and interpreting skills. This task helps reinforce the idea that when a variable represents time, t = 0 is chosen as an arbitrary point in time and positive times are interpreted as times that happen after that.

Parent Resources

Name	Description
As the Wheel Turns:	In this task, students use trigonometric functions to model the movement of a point around a wheel and, through space. Students also interpret features of graphs in terms of the given real-world context.
Average Cost:	This task asks students to find the average, write an equation, find the domain, and create a graph of the cost of producing DVDs.
Graphing Lines:	Allows students access to a Cartesian Coordinate System where linear equations can be graphed and details of the line and the slope can be observed.
How Is the Weather?:	This task can be used as a quick assessment to see if students can make sense of a graph in the context of a real world situation. Students also have to pay attention to the scale on the vertical axis to find the correct match. The first and third graphs look very similar at first glance, but the function values are very different since the scales on the vertical axes are very different. The task could also be used to generate a group discussion on interpreting functions given by graphs.
Logistic Growth Model, Abstract Version:	This task is for instructional purposes only and students should already be familiar with some specific examples of logistic growth functions. The goal of this task is to have students appreciate how different constants influence the shape of a graph.
Logistic Growth Model, Explicit Version:	This problem introduces a logistic growth model in the concrete settings of estimating the population of the U.S. The model gives a surprisingly accurate estimate and this should be contrasted with linear and exponential models.
Sum of Even and Odd:	Students explore and manipulate expressions based on the following statement: A function f defined for -a < x < a is even if f(-x)=f(x) and is odd if f(-x)=-f(x) when -a < x < a. In this task we assume f is defined on such an interval, which might be the full real line (i.e., a=8).
Telling a Story with Graphs:	In this task students are given graphs of quantities related to weather. The purpose of the task is to show that graphs are more than a collection of coordinate points; they can tell a story about the variables that are involved, and together they can paint a very complete picture of a situation, in this case the weather. Features in one graph, like maximum and minimum points, correspond to features in another graph. For example, on a rainy day, the solar radiation is very low, and the cumulative rainfall graph is increasing with a large slope.
The Canoe Trip, Variation 1:	The purpose of this task is to give students practice constructing functions that represent a quantity of interest in a context, and then interpreting features of the function in the light of the context. It can be used as either an assessment or a teaching task.
The Canoe Trip, Variation 2:	The primary purpose of this task is to lead students to a numerical and graphical understanding of the behavior of a rational function near a vertical asymptote, in terms of the expression defining the function.
	This task could be used for assessment or for practice. It allows students to compare characteristics of two quadratic

Throwing Baseballs:	functions that are each represented differently, one as the graph of a quadratic function and one written out algebraically. Specifically, students are asked to determine which function has the greatest maximum and the greatest non-negative root.
Warming and Cooling:	This task is meant to be a straight-forward assessment task of graph reading and interpreting skills. This task helps reinforce the idea that when a variable represents time, t = 0 is chosen as an arbitrary point in time and positive times are interpreted as times that happen after that.