Algebra 2

ELG HS.F.2: Interpret functions that arise in applications in terms of the context

Vertical Progression:

8th Grade	**8.F.A Define, evaluate, and compare functions** o **8.F.A.3** Interpret the equation *y = mx + b* as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. **8.F.B Use functions to model relationships between quantities.** o **8.F.B.4** Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values. o **8.F.B.5** Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.
Algebra 1	**ELG.MA.HS.F.2 Interpret functions that arise in applications in terms of the context** o **F-IF.4** 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*.★ o **F-IF.5** Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. *For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function*.★ o **F-IF.6** Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.★ Note: Functions include linear, exponential, quadratic, square root, cube root, and piece-wise-defined functions.
Algebra 2	**ELG.MA.HS.F.2 Interpret functions that arise in applications in terms of the context** o **F-IF.4** 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*.★ o **F-IF.6** Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.★ Note: Functions may include linear, quadratic, exponential, polynomial (quadratic or cubic), square root, cube root, and piecewise-defined functions (including step and absolute value).

Algebra 2

ELG HS.F.2: **Interpret functions that arise in applications in terms of the context**

Students will demonstrate command of the ELG by:

- Sketching a graph and labeling the intercepts.
- Identifying and interpreting where the function is increasing, decreasing, positive, or negative.
- Identifying and interpreting relative maximums and minimums.
- Calculating the rate of change given a table of values.
- Estimating the rate of change given a graph of a function.
- Interpreting the meaning of the rate of change in the context of the problem.

Vocabulary:

- average rate of change
- decreasing interval
- end-behavior
- increasing interval
- intercept
- interval
- periodicity
- relative maximum
- relative minimum
- slope
- symmetry
- x-intercept
- y-intercept

Sample Instructional/Assessment Tasks:

1) **Standard(s): F-IF.4**
Source: NC DPI & SBAC

Item Prompt:

A rocket is launched from 180 feet above the ground at time $t = 0$. The function that models this situation is given by $h(t) = -16t^2 + 96t + 180$, where t is measured in seconds and h is height above the ground measured in feet.

a. What is the practical domain for t in this context? Answer: **0 to 7.5 sec**

b. What is the height of the rocket two seconds after it was launched? Answer: **308 ft.**

c. What is the maximum value of the function and what does it mean in context? Answer: **324 feet, It is the greatest height before descent.**

d. When is the rocket 100 feet above the ground? Answer: **About 6.74 sec**

e. When is the rocket 250 feet above the ground? Answer: **About 0.85 sec going up and about 5.15 sec going down.**

f. Why are there two answers to part e but only one practical answer for part d? Answer: **The graph shows a second point at 100 feet, but it is negative and negative time is not practical. In addition, the object is thrown from a starting point of 180 feet.**

g. What are the intercepts of this function? What do they mean in the context of this problem? Answer: ***y*-intercept = 180 feet, the height at time zero. *x*-intercepts are at –1.5 and 7.5. –1.5 is not practical as there is no negative time. 7.5 is when the object hits the ground.**

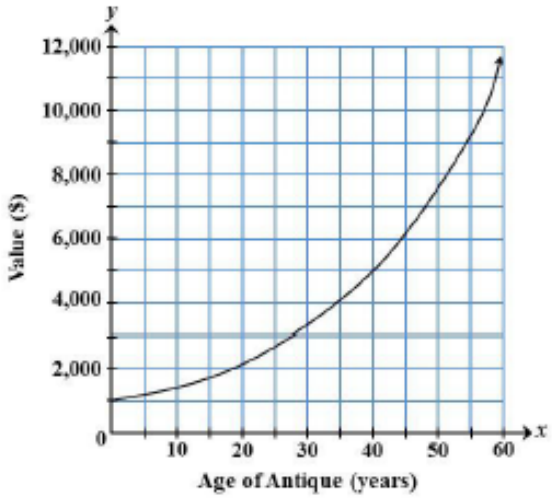
h. What are the intervals of increase and decrease on the practical domain? What do they mean in the context of the problem? **Answer: Increasing from x=0 to the maxima at x=3. Decreasing after the maxima to x=7.5 which is when the object is on the ground.**

2) Standard(s): F-IF.6

Source: SBAC

Item Prompt:

The value of an antique has increased exponentially, as shown in this graph.



Based on the graph, estimate to the nearest $50 the average rate of change in value of the antique for the following time intervals:

a. From 0 to 20 years: $_____

b. From 20 to 40 years: $_____

Correct Answer:

a. 50

b. $150