Content Area: Math Grade Level: HS Algebra 2

Reporting Measure: Graphing Functions

Level	Description
Above & Beyond (4.0)	The student will: • Develop a strategy to match the graph of a rational function to its formula (for example, evaluate the key features of a graph and explain how those would manifest in a formula).
3.5	In addition to score 3.0 performance, partial success at score 4.0 content
Proficient (3.0)	The student will: **GRF1—Graph various types of functions** (for example, linear functions, quadratic functions, exponential functions, piecewise-defined functions, and absolute value functions). **GRF2—Interpret key features of functions** (for example, intercepts, increasing intervals, decreasing intervals, positive intervals, negative intervals, absolute maximum, absolute minimum, relative maximums, relative minimums, symmetries, and asymptotes). **GRF3—Explain the relationship between changes in the equation for a function and its graph** (for example, explain the effect of adding or multiplying the inputs and outputs of a function by positive or negative numbers).
2.5	No major errors or omissions regarding score 2.0 content, and partial success at score 3.0 content
Getting There (2.0)	**GRF1—**The student will recognize or recall specific vocabulary (for example, *maximum*, *minimum*) and perform basic processes such as: • Identify the *y*-intercept and slope to graph a linear function. • Identify the vertex, *x*-intercepts, and *y*-intercept to graph a quadratic function. • Select an appropriate set of points when graphing an exponential function. • Identify the type of graph that will be created by each section of a piecewise-defined function. • Identify the maximum or minimum value and the slope of the lines to the left and right of the vertex to graph an absolute value function. **GRF2—**The student will recognize or recall specific vocabulary (for example, *asymptote*, *decreasing interval*, *increasing interval*, *line of symmetry*, *relative maximum*, *relative minimum*) and perform basic processes such as: • List key features of graphs of functions. For example, intercepts, increasing intervals, decreasing intervals, positive intervals, negative intervals, absolute maximum, absolute minimum, relative maximums, relative minimums, and symmetries. • Label key features on the graph of a function. • Match the key features of a function modeling a real-world situation to their real-world meanings. For example, for the graph of a function modeling temperature over time, explain that the *y*-intercept indicates the time at which measurements began to be taken, the *x*-intercept indicates the time at which the temperature was zero, increasing and decreasing intervals indicate times when the temperature was increasing or decreasing, positive and negative intervals indicate times when the temperature was above or below zero, the absolute maximum and minimum indicate the high and low temperatures during the measurement interval, and relative maximums or minimums indicate short-term variations in temperature during the measurement interval.

	GRF3—The student will recognize or recall specific vocabulary (for example, *even function*, *odd function*, *shift*, *squeeze*, *stretch*) and perform basic processes such as: • Explain that adding a positive or negative number to the output of a function shifts the graph up or down respectively, and adding a positive or negative number to the input of a function shifts the graph left or right respectively. For example, $g(x) = f(x) + 1$ shifts the graph up by 1 and $g(x) = f(x + 1)$ shifts the graph to the left by 1. • Explain that multiplying the output of a function by a positive number stretches (for numbers with magnitude greater than 1) or squeezes (for numbers with magnitude less than 1) the graph vertically, and multiplying the input of a function by a positive number stretches (for numbers with magnitude less than 1) or squeezes (for numbers with magnitude greater than 1) the graph horizontally. For example, $g(x) = 2f(x)$ stretches the graph vertically by a factor of 2 and $g(x) = f(2x)$ squeezes the graph horizontally by a factor of 2. • Explain that multiplying the output of a function by -1 reflects the graph across the *x*-axis and multiplying the input by -1 reflects the graph across the *y*-axis. For example, $g(x) = -f(x)$ reflects the graph across the *x*-axis and $g(x) = f(-x)$ reflects the graph across the *y*-axis. • Identify the graphs of even and odd functions. • Give examples of functions that are even, odd, or neither. For example, explain that $f(x) = x^2$ is an even function, $f(x) = x^3$ is an odd function, and $f(x) = x^3 + 1$ is neither even nor odd.
1.5	Partial success at score 2.0 content, and major errors or omissions regarding score 3.0 content
Beginning (1.0)	With help, partial success at score 2.0 content and score 3.0 content