Unit 3: Key Features & Sketching Graphs

A. Key Features of Graphs

CCSS	4 – Mastery	3 – Proficient	2 - Basic	1 – Below Basic	0 – No Evidence
Identify and compare key features (F.IF.4, F.IF.5)	Can extend thinking beyond the standard, including tasks that may involve one of the following: • Designing • Connecting • Synthesizing • Applying • Justifying • Critiquing • Analyzing • Creating • Proving	Identify and compare key features of two functions represented in <u>**all**</u> of the following ways • algebraically • graphically • tables • in context	Identify and compare key features of two functions represented in <u>**three**</u> of the following ways • algebraically • graphically • tables • in context	Identify and compare key features of two functions represented in <u>**two**</u> of the following ways • algebraically • graphically • tables • in context	Little evidence of reasoning or application to solve the problem Does not meet the criteria in a level 1
Identify transformations (F.BF.3)		Identify the effect on a graph by replacing f(x) with a single transformation: • f(x) + k • k f(x), • f(kx) • f(x + k) for specific positive and negative values of k Given the graph of a function and a single transformation <u>**(for all listed above)**</u>, find the value of the constant or coefficient	Identify the effect on a graph by replacing f(x) with a single transformation <u>**(3 of the 4)**</u>: • f(x) + k • k f(x), • f(kx) • f(x + k) for specific positive and negative values of k Given the graph of a function and a single transformation <u>**(3 of the 4 listed above)**</u>, find the value of the constant or coefficient	Identify the effect on a graph by replacing f(x) with a single transformation <u>**(2 of the 4)**</u>: • f(x) + k • k f(x), • f(kx) • f(x + k) for specific positive and negative values of k Given the graph of a function and a single transformation <u>**(2 of the 4 listed above)**</u>, find the value of the constant or coefficient	
Calculate and interpret rate of change (F.IF.6*)		Calculate the average rate of change over a given interval and explain the meaning in context for linear and exponential functions presented in symbolic, table <u>and</u> graph form	Calculate the average rate of change over a given interval <u>and explain the meaning in context</u> for linear and exponential functions presented in symbolic, table <u>or</u> graph form	Calculate the average rate of change over a given interval for linear and exponential functions presented in symbolic, table <u>or</u> graph form	
Identify and compare key features **(F.IF.9)**		Identify and compare key features of two functions represented in all of the following ways • algebraically • graphically • tables • in context	Identify and compare key features of two functions represented in three of the following ways • algebraically • graphically • tables • in context	Identify and compare key features of two functions represented in two of the following ways • algebraically • graphically • tables • in context	

F.BF.3 Identify the effect on the graph of replacing f(x) by f(x + k), k f(x), f(kx) and f(x) + k, for specific values of k (both negative and positive); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.

F.IF.4 For a linear, exponential, or quadratic 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; and end behavior. *

F.IF.5 Relate the domain of a linear, exponential, ~~or quadratic 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. *

F.IF.6* Calculate and interpret the average rate of change of a linear, exponential, ~~or quadratic~~ function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph of a function over a specified interval. *

F.IF.9* Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables or by verbal descriptions). For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.

Unit 3: Key Features & Sketching Graphs

B. Sketching Graphs

<table>
<tr><th>CCSS</th><th>4 – Mastery</th><th>3 – Proficient</th><th>2 - Basic</th><th>1 – Below Basic</th><th>0 – No Evidence</th></tr>
<tr><td>Understand solutions
(A.REI.10)</td><td rowspan="3">Can extend thinking beyond the standard, including tasks that may involve one of the following:
• Designing
• Connecting
• Synthesizing
• Applying
• Justifying
• Critiquing
• Analyzing
• Creating
• Proving</td><td><u>Explain</u> that all solutions to an equation in two variables are contained on the graph of that equation</td><td>Verifies that <u>multiple solutions</u> to an equation in two variables are contained on the graph of that equation.</td><td><u>Verifies</u> that <u>one solution</u> to an equation in two variables is contained on the graph of that equation.</td><td rowspan="3">Little evidence of reasoning or application to solve the problem

Does not meet the criteria in a level 1</td></tr>
<tr><td>Graph inequalities
(A.REI.12)</td><td>Graph linear inequalities in two variables from contextual situations and identify the solution set.</td><td>Graph linear inequalities in two variables (standard form) and identify the solution set.</td><td>Graph <u>a linear inequality</u> in two variables (slope intercept form) and identify the solution set.</td></tr>
<tr><td>Graph equations
(F.IF.7)</td><td>Graph functions expressed in symbolic form and show key features of the graph (including labels and scales on the graph)</td><td>Graph functions expressed in symbolic form and show key features of the graph</td><td>Graph functions expressed in symbolic form</td></tr>
</table>

A.REI.10 Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).

A.REI.11* Explain why the x-coordinates of the points where the graphs of the equations y = f(x) and y = g(x) intersect are the solutions of the equation f(x) = g(x); find solutions to f(x) = g(x) approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where f(x) and/or g(x) are linear, quadratic, or exponential functions. *(Modeling Standard).

A.REI.12 Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality~~), and graph the solution set to a system of linear inequalities in two variables as the intersection~~

F.IF.7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.