WEEK 8: ALGEBRA - GRAPHING

Comparing Lines

Let \( f(x) = ax + b \), and \( g(x) = cx + d \), where \( a, b, c, \) and \( d \) are any real numbers. If \( f(x) \) and \( g(x) \) are graphed, what can you conclude about \( a, b, c, \) and/or \( d \), if:

- a. \( f(x) \) and \( g(x) \) are parallel?
- b. \( f(x) \) and \( g(x) \) are perpendicular?
- c. \( f(x) \) does not cross the x-axis?
- d. \( g(x) \) is horizontal?
- e. \( f(x) \) and \( g(x) \) have the same y-intercept?

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<th>GPS</th>
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| **M7A1:** Students will represent and evaluate quantities using algebraic expressions.  
  b. Use and evaluate algebraic expressions. | The student can evaluate algebraic expressions and their graphs in this investigation. |
| **M7A3:** Students will understand relations and functions.  
  b. Represent, describe and analyze a functional relation from a table, graph, and/or formula. | This investigation requires the student to represent each equation as a graph and then compare and analyze the equations for \( f(x) \) and \( g(x) \). |
| **M8A2:** Students will understand linear relations and functions.  
  b. Translate among verbal, tabular, graphic, and algebraic representations of functions. | The student could translate between the algebraic representation of the functions (equation) and their graphs. |
| **M8A3:** Students will graph and analyze graphs of linear equations.  
  b. Graph equations of the form \( y = mx + b \).  
  d. Determine the equation of a line given a graph or data.  
  e. Interpret the meaning of the slope and y-intercept in a given situation. | The student will graph both functions, which are in the form of \( y=mx + b \). The student must also be able to find cases in which the graphs of the two equations meet the given conditions specified in this problem. |
Intersecting Graphs

Examine the graphs of a line, a parabola, and an exponential function. When any two of these graphs are graphed on the same set of axes, which pair(s) will produce the most intersections? the least intersections? Explain your reasoning.

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| **M8A2:** Students will understand linear relations and functions.  
a. Identify relations and functions as linear or nonlinear.  
b. Translate among verbal, tabular, graphic, and algebraic representations of functions. | The student should be able to translate between the algebraic representation of the functions (equation) and their graphs. The student must also be able to understand how each equation influences its graph. The student will need to recognize the characteristics of a linear function as compared to a non-linear function. |
| **M8A3:** Students will graph and analyze graphs of linear equations.  
b. Graph equations of the form \( y = mx + b \). | The student will graph a line in the form of \( y = mx + b \), a parabola in the form of \( y = ax^2 + bx + c \), and an exponential function, \( y = k^x \).  
In exploring this investigation, the student should recognize the characteristics of a linear function and be able to identify a linear function versus a non-linear function. |