#### Performance Task Instructions

You are to **construct a piece-wise defined function**. Your piece-wise defined function should:

- 1) be defined by at least 12 different pieces, including at least one of each of the following functions:
  - a. Constant
  - b. Linear
  - c. Absolute Value
  - d. Quadratic
  - e. Polynomial of degree 3 or higher
  - f. Exponential
  - g. Rational
  - h. Irrational (Square Root or Cube Root)
  - i. Sine/Cosine
- 2) be discontinuous in at least 8 places, including at least two instances of each of the following types of discontinuity:
  - a. removable
  - b. jump/step
  - c. infinite/asymptotic
- 3) be continuous in at least 2 places *where one piece ends and another piece begins*, including one instance of each of the following types of continuity:
  - a. continuous but not differentiable
  - b. continuous and differentiable

Your final product will include two graphs:

- a <u>hand-drawn graph</u> using a poster board or presentation paper
- a <u>computer-drawn graph</u> using either Winplot or Geogebra or Demos

Your final product will include a completed version of the following graphic organizer:

Numbered	Algebraic representation	Type of function	Domain of function	Range of function
function	of function			
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				

(you can add more rows if you use more than 12 functions)

#### Your final product will include a completed version of the following graphic organizer:

At each *x*-coordinate where one piece ends and another piece begins, complete the following:

Limit	Verbal explanation (using mathematical notation) of why the limit has this value (or why the limit doesn't exist)
$\lim_{x \to [-]} f(x) =$	
$\lim_{x \to []} f(x) =$	

Your final product will include a completed version of the following graphic organizer:

Lettered discontinuity	Type of discontinuity: <b>B</b> =removable	<i>x</i> -coordinate of	Use limit notation (including one-sided limits) to mathematically explain why the
uiscontinuity	J/S=jump/step	discontinuity	type of discontinuity occurs at the
	I/A=infinite/asymptotic		indicated <i>x</i> -coordinate.
А.			
В.			
C.			
D.			
E.			
F.			
G.			
Н.			

#### Your final product will include a completed version of the following graphic organizer:

Lettered continuity	Type of continuity: CD=continuous/ differentiable CND=continuous/ not differentiable	<i>x</i> -coordinate of continuity	Use precise mathematical language <b>or</b> limit notation (including one-sided limits) to mathematically explain why the type of continuity occurs at the indicated <i>x</i> -coordinate.
Ρ.			
Q.			

#### Your final product will include a completed version of the following graphic organizer:

Provide a list of the domains on which your	Provide a list of the domains on which your
function is increasing	function is decreasing

To show a numeric understanding of asymptotic behavior, identify a vertical asymptote on your graph.

Equation of vertical asymptote: \_\_\_\_\_

Construct a table of values of the function for values of x getting closer and closer to the x-value of the vertical asymptote:

x	f(x)