Continuity and Piecewise Functions Name: ______________________________

Now that you're in calculus class, you're always seeing the math wherever you go. Just the other day, you were at Lunds, where they were trying to sell some extra avocadoes, so they had a promotion going on. "Buy 4 avocadoes for $1.98 a piece, and get each one after that for half off. Limit: 10 avocadoes per customer."

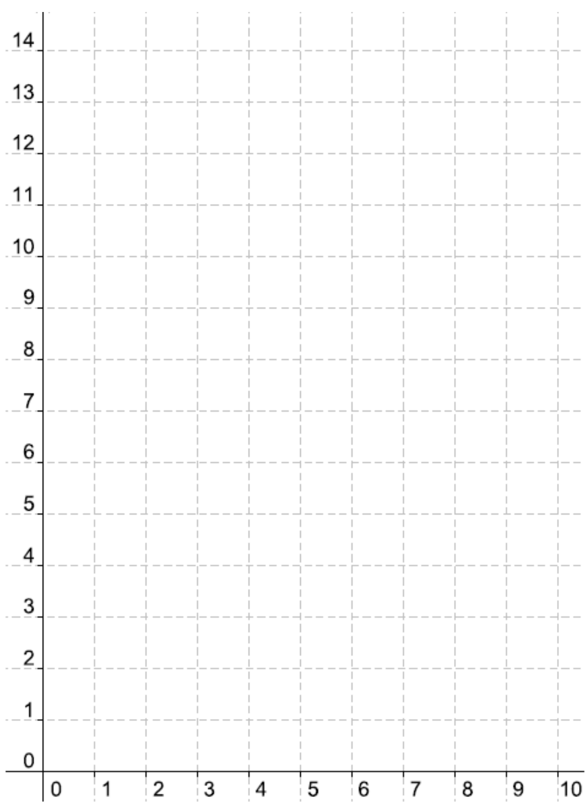
"Wait a minute!" you shouted. "The price of avocadoes is a piecewise function." You are very clever. You scare the other shoppers at Lunds a little bit, but you are very clever.

Of course, right away you wanted to write a function definition for your piecewise function, but you felt a little bit stuck, so you decided to start with a table.

Number of Avocadoes	1	2	3	4	5	6	7	8	9	10
Total Cost										

Before you go any further, be aware that Lunds employees have been trained laugh at you when you ask to buy a part of an avocado. Describe the domain of your function:

There's a grocery store down the street (Real Groceries) that will cut the avocadoes and sell you any fraction (or irrational piece) of an avocado. Otherwise, the price is identical at both stores. Describe the domain of the function at Real Groceries:



Use the grid to graph the total cost of avocadoes vs. number of avocadoes at Real Groceries.

Is the cost of avocadoes at Lunds continuous?

Why or why not?

Is the cost of avocadoes at Real Groceries continuous?

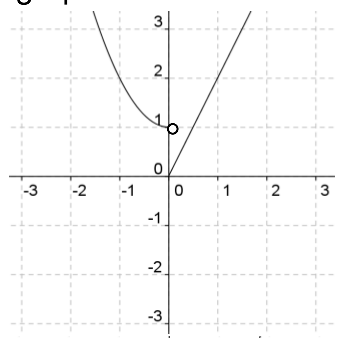
Why or why not?

Now, you're finally ready! Write the piecewise function for the cost of avocadoes at Real Groceries:

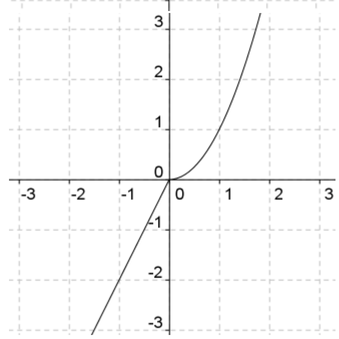
$$C(a) = \{$$

Check in with your neighbors before you move on…
Write the name of the piecewise function next to its graph:

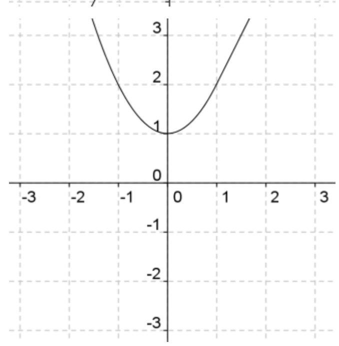
$$f(x) = \begin{cases} 2x \text{ for } x \leq 0 \\ x^2 \text{ for } x > 0 \end{cases}$$



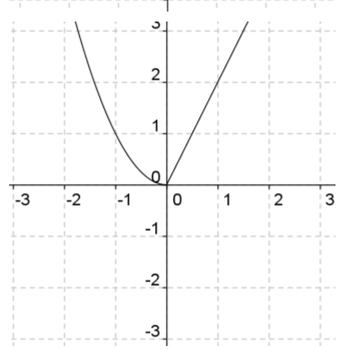
$$g(x) = \begin{cases} 2x \text{ for } x \geq 0 \\ x^2 \text{ for } x < 0 \end{cases}$$



$$h(x) = \begin{cases} 2x \text{ for } x \geq 0 \\ x^2 + 1 \text{ for } x < 0 \end{cases}$$



$$k(x) = \begin{cases} 2x \text{ for } x \geq 1 \\ x^2 + 1 \text{ for } x < 1 \end{cases}$$



Which of the functions is *not* continuous?

Explain how you can tell from the graph whether a piecewise function is continuous.

Explain how you can tell from the function definition whether a piecewise function is continuous. Don't continue until you have a good method.

OK, now. You've bought avocadoes at a Real Grocery store. You've matched graphs to piecewise functions. It's time for the biggest challenge of all. Pick your favorite number from the set of numbers {1, 2, 3, 4, 5}. Write it down.

____

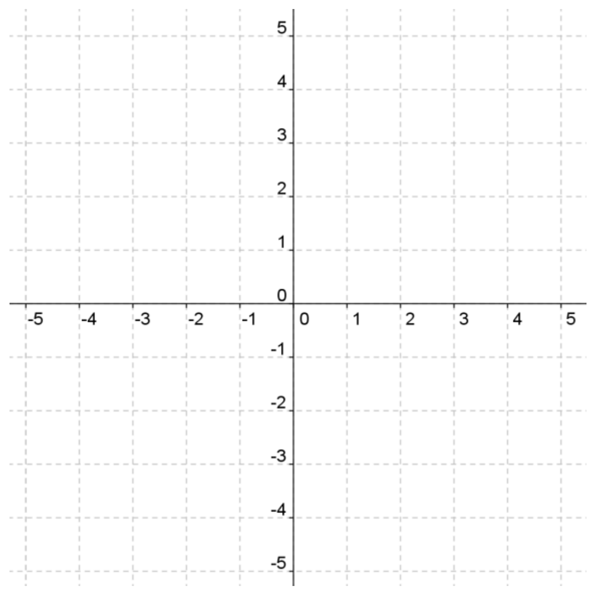
For the next problem *k* stands for your favorite number (written above), and g(x) is the piecewise function defined below.

$$g(x)=\begin{cases} 0.5x \text{ for } x \geq 2 \\ x^2 - k \text{ for } x < 2 \end{cases}$$

Graph g(x).

Is g(x) continuous?

For what value of k would g(x) be continuous?



For each of the following problems find the value of the constant k that would make h(x) continuous.

$$h(x)=\begin{cases} \sin x \text{ for } x \geq 0 \\ \cos x + k \text{ for } x < 0 \end{cases}$$

k = _____

$$h(x)=\begin{cases} x^2 + k \text{ for } x \leq 2 \\ x^3 \text{ for } x > 2 \end{cases}$$

k = _____

$$h(x)=\begin{cases} x^3-2x-5 & \text{for } x<2 \\ x^2+x+k & \text{for } x\geq 2 \end{cases}$$

k = ______

$$h(x)=\begin{cases} 2x^2 & \text{for } x\geq -1 \\ kx & \text{for } x<-1 \end{cases}$$

k = ______

Write a description in words of how you approached these problems.