

Name: Solutions

You must *show all work* to receive full credit.

Answers and assertions must be fully explained and justified.

Your solutions must be clear, concise, and easy to follow.

1. Let  $A$  be the set of all restaurants in America and let  $C$  be the set of all American counties/parishes. Define a function  $f: A \rightarrow C$  and clearly explain why what you defined is *actually* a function. Then, give the domain, target, and range of your function. for  $x \in A$

- Define  $f: A \rightarrow C$  such that  $f(x) =$  the county/parish in which  $x$  is located
- This is a function because each restaurant in America is located in exactly one county/parish. Therefore, each element in  $A$  is mapped to exactly one element in set  $C$ .
- Domain( $f$ ) =  $A$
- Target( $f$ ) =  $C$
- Range( $f$ ) = all counties/parishes in the US that contain restaurants

2. If  $g(2) = -5$ ,  $g(4) = 0$ ,  $g(-1) = -12.5$ , and  $g(5) = 3.5$ , is  $g$  a linear function? If not, clearly explain why not. If so, find a linear equation for  $g(x)$ .

- No,  $g$  is not a linear function because linear functions have the same Average rate of change.
- In  $g$ , the ARC between  $x=4$  and  $x=5$  is:
$$\frac{3.5 - 0}{5 - 4} = \frac{3.5}{1} = 3.5$$
- However, the ARC between  $x=2$  and  $x=4$  is:
$$\frac{0 - (-5)}{4 - 2} = \frac{5}{2} = 2.5$$
- Therefore  $g$  is not linear because  $2.5 \neq 3.5$ .

3. Write  $f(x) = |4x - 3|$  as a piecewise function where each piece is defined on an *interval* of  $x$ -values.

• When  $4x - 3 \geq 0$ ,  $|4x - 3| = 4x - 3$ .

$$4x - 3 \geq 0 \Rightarrow 4x \geq 3 \Rightarrow x \geq \frac{3}{4}$$

Therefore,  $|4x - 3| = 4x - 3$  when  $x \in [\frac{3}{4}, \infty)$

• When  $4x - 3 < 0$ ,  $|4x - 3| = -(4x - 3)$

$$4x - 3 < 0 \Rightarrow 4x < 3 \Rightarrow x < \frac{3}{4}$$

Therefore,  $|4x - 3| = -(4x - 3)$  when  $x \in (-\infty, \frac{3}{4})$

• Combining these, we obtain

$$f(x) = \begin{cases} -(4x - 3), & \text{if } x < \frac{3}{4} \\ 4x - 3, & \text{if } x \geq \frac{3}{4} \end{cases}$$

**\*\*BONUS\*\*** If you had to decide today, what would your major be at Centre, and what would you plan to do after graduation?