Name: _____ Date: _____

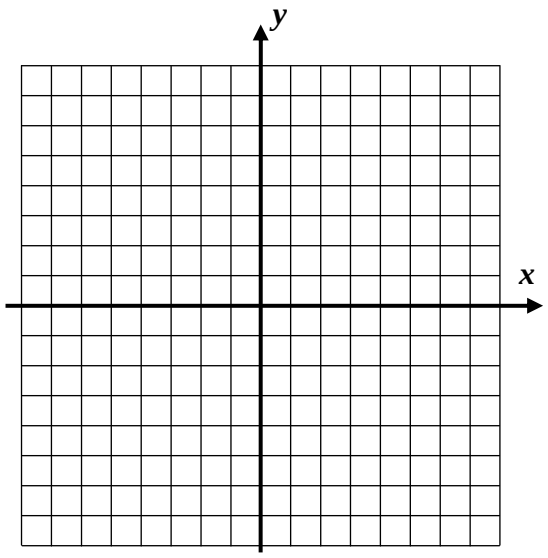
PIECEWISE LINEAR FUNCTIONS
COMMON CORE ALGEBRA II

Functions expressed algebraically can sometimes be more complicated and involve **different equations** for **different portions of their domains**. These are known as **piecewise functions** (they come in pieces). If all of the pieces are linear, then they are known as **piecewise linear functions**.

***Exercise* #1:** Consider the piecewise linear function given by the formula $f(x)=\begin{cases} x-3 & -3\le x<0 \\ \frac{1}{2}x+4 & 0\le x\le 4 \end{cases}$.

(a) Create a table of values below and graph the function.

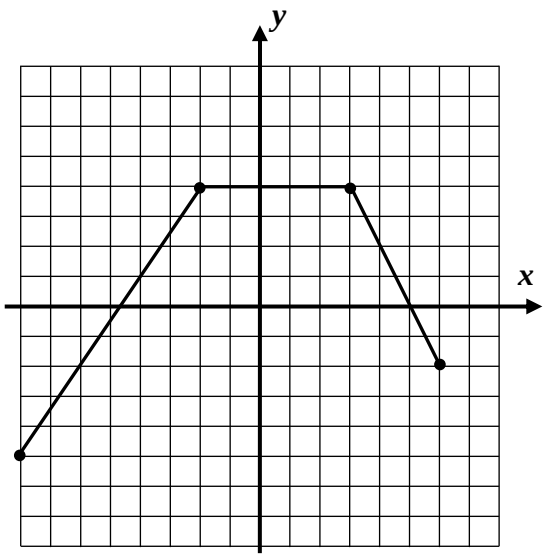
x	−3	−2	−1	0	1	2	3	4
$f(x)$								



(b) State the range of *f* using interval notation.

Not only should we be able to graph piecewise functions when we are given their equations, but we should also be able to translate the graphs of these functions into equations.

***Exercise* #2:** The function $f(x)$ is shown graphed below. Write a piecewise linear formula for the function. Be sure to specify both the formulas and the domain intervals over which they apply.



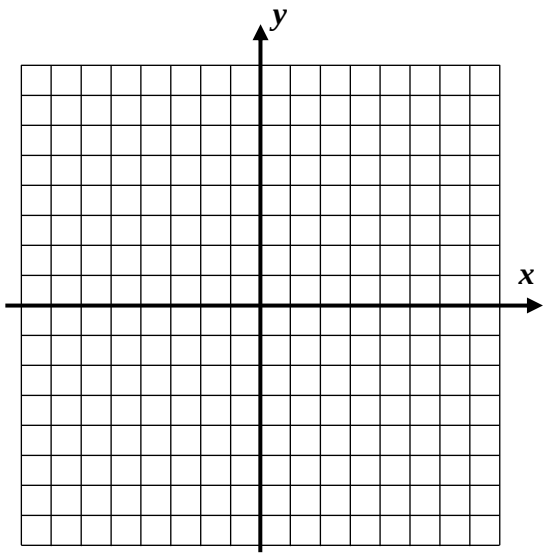
Piecewise equations can be challenging algebraically. Sometimes information that we find from them can be misleading or incorrect.

***Exercise* #3:** Consider the piecewise linear function $g(x)=\begin{cases} 5-x & x<2 \\ \frac{1}{2}x+2 & x\geq 2 \end{cases}$.

(a) Determine the *y*-intercept of this function algebraically. Why can a function have only one *y*-intercept?

(b) Find the *x*-intercepts of each individual linear equation.

(c) Graph the piecewise linear function below.



(d) Why does your graph contradict the answers you found in part (b)?

(e) How can you resolve the fact that the algebra seems to contradict your graphical evidence of *x*-intercepts?

***Exercise* #4:** For the piecewise linear function $f(x)=\begin{cases} -2x+10 & x\leq 0 \\ 5x-1 & x>0 \end{cases}$, find all solutions to the equation $f(x)=1$ algebraically.

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PIECEWISE LINEAR FUNCTIONS
COMMON CORE ALGEBRA II HOMEWORK

FLUENCY

1. For $f(x)=\begin{cases} 5x-3 & x<-2 \\ x+8 & -2\le x<3 \\ \frac{1}{3}x+7 & x\ge 3 \end{cases}$ answer the following questions.

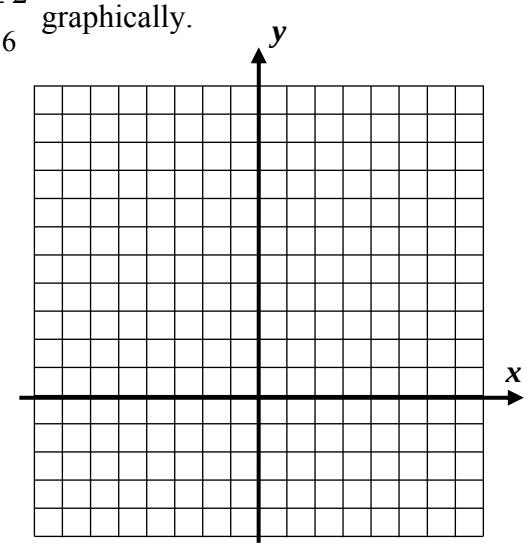
   (a) Evaluate each of the following by carefully applying the correct formula:

   (i) $f(2)$ (ii) $f(-4)$ (iii) $f(3)$ (iv) $f(0)$

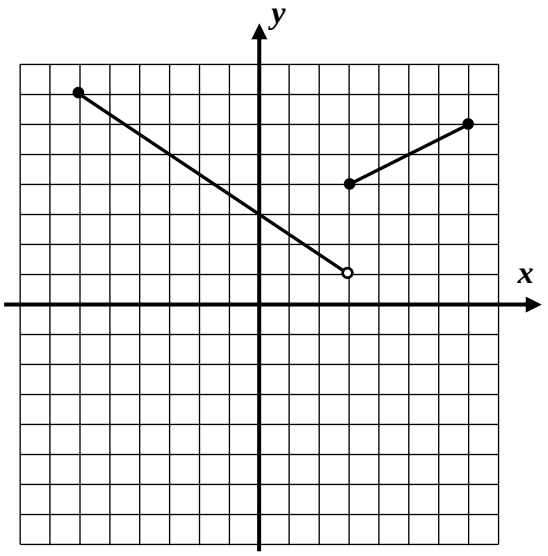
   (b) The three linear equations have *y*-intercepts of $-3, 8$ and 7 respectively. Yet, a function can have only one *y*-intercept. Which of these is the *y*-intercept of this function? Explain how you made your choice.

   (c) Calculate the average rate of change of *f* over the interval $-3\le x\le 9$. Show the calculations that lead to your answer.

2. Determine the range of the function $g(x)=\begin{cases} x+4 & -2\le x\le 2 \\ -\frac{3}{2}x+9 & 2<x\le 6 \end{cases}$ graphically.



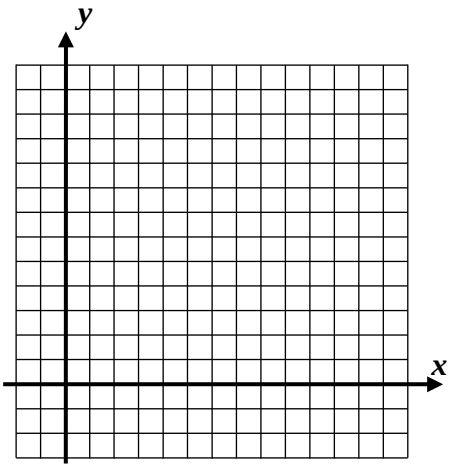
3. Determine a piecewise linear equation for the function $f(x)$ shown below. Be sure to specify not only the equations, but also the domain intervals over which they apply.



REASONING

4. Step functions are piecewise functions that are constants (horizontal lines) over each part of their domains. Graph the following step function.

$$f(x)=\begin{cases}-2 & 0\le x<3\\ 3 & 3\le x<5\\ 7 & 5\le x<10\\ 5 & 10\le x\le 12\end{cases}$$



5. Find all x-intercepts of the function $g(x)=\begin{cases}2x+8 & -5\le x<-1\\ -\frac{1}{2}x-4 & -1\le x<1\\ -4x+10 & 1\le x\le 4\end{cases}$ algebraically. Justify your work by showing your algebra. Be sure to check your answers versus the domain intervals to make sure each solution is valid.