

Name: \_\_\_\_\_

Date: \_\_\_\_\_

**PIECEWISE DEFINED FUNCTIONS**  
**ALGEBRA 2 HONORS**

Recall that a function is simply a rule that tells us how to convert an input (typically an  $x$  value) into an output (typically a  $y$  value). These rules can be simple or more complicated. A **piecewise function** is one where different equations are used to define a function over different parts of its domain. The first exercise will illustrate this concept.

**Exercise #1:** Given the function defined by  $f(x) = \begin{cases} 4 - x^2 & x \leq 0 \\ 4x + 2 & x > 0 \end{cases}$  answer the following questions.

(a) Evaluate  $f(5)$ ,  $f(-3)$ , and  $f(0)$ . Show the work necessary.

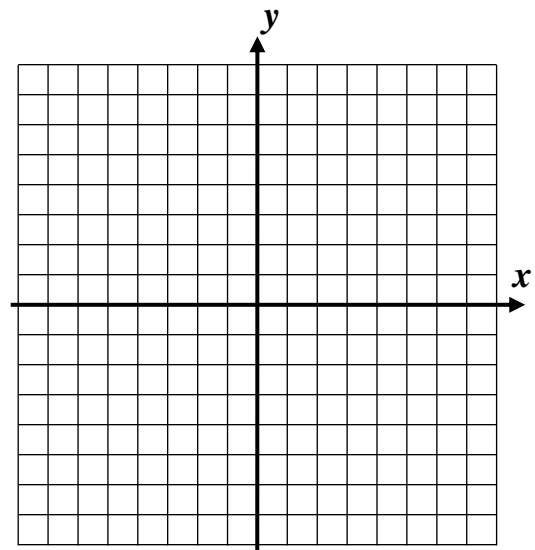
(b) Determine the intercepts of this function *algebraically*.

We will concentrate this year on simply understanding the concept of piecewise defined functions and concentrate mostly on graphing **piecewise linear function**, or those whose formulas are always linear.

**Exercise #2:** Consider the function  $g(x) = \begin{cases} x + 1 & x < 0 \\ -\frac{3}{2}x + 5 & x \geq 0 \end{cases}$ .

(a) What is this function's  $y$ -intercept? Show the work you use to find the answer.

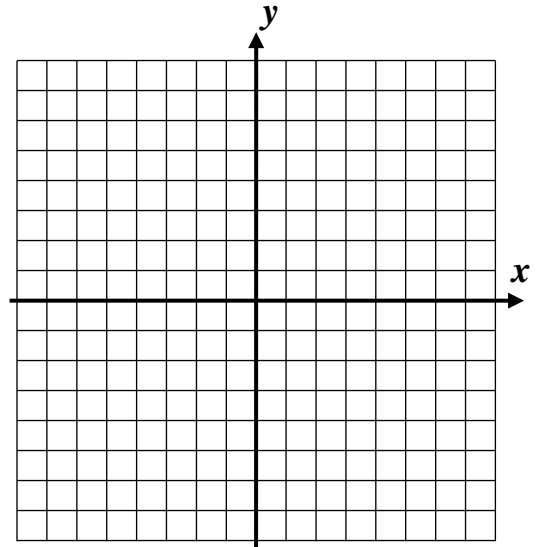
(b) Graph the function on the grid provided to the right.



A piecewise function can be defined using more than two formulas. The Federal Income Tax calculation is actually a piecewise linear function that uses up to five separate formulas.

**Exercise #3:** Consider the function given by  $y = \begin{cases} -\frac{1}{2}x - 4 & x \leq 0 \\ 3 & 0 < x < 3 \\ 2x - 2 & x > 3 \end{cases}$ .

(a) Graph the function on the grid provided.



(b) What is the domain of this function? State your answer using set-builder notation.

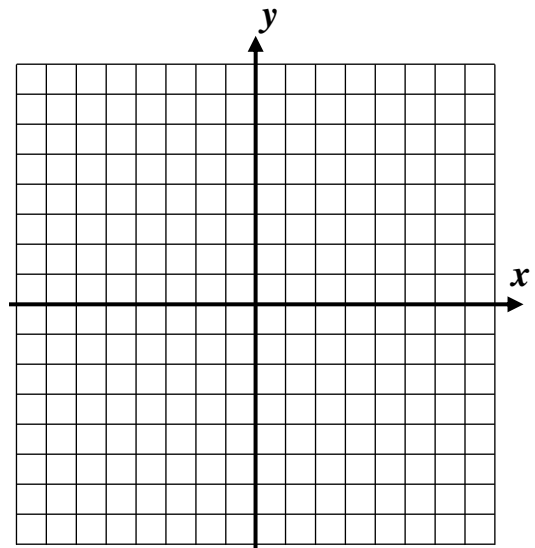
Piecewise functions can pose interesting challenges when it comes to identifying domains and ranges (as Exercise #3 (b) illustrated). Of particular interest now is the range of a function.

**Exercise #4:** Consider the function  $f(x) = \begin{cases} \frac{2}{3}x - 4 & x < 3 \\ x - 1 & x \geq 3 \end{cases}$ .

(a) Graph the function on the grid provided.

(b) What is the domain of this function?

(c) What is the range of this function? State your answer using interval notation.



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**PIECEWISE DEFINED FUNCTIONS**  
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1. Consider the piecewise defined function  $g(x) = \begin{cases} \frac{x}{x-3} & x < 0 \\ 5x+7 & x \geq 0 \end{cases}$ .

(a) Evaluate  $g(-3)$ ,  $g(0)$ , and  $g(2)$ .

(b) What is this function's  $y$ -intercept?

(c) The fraction  $\frac{x}{x-3}$  is undefined at  $x=3$ . Is  $x=3$  part of this piecewise function's domain? Explain your yes or no answer.

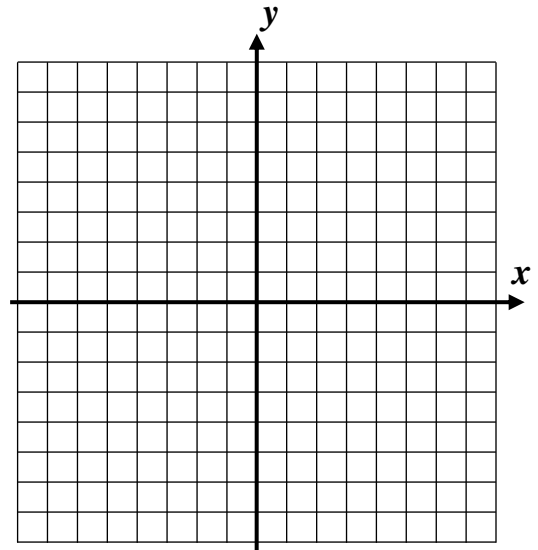
2. Consider the piecewise defined function  $f(x) = \begin{cases} x^2 + 2x - 3 & x < 1 \\ 2x - 8 & x \geq 1 \end{cases}$ .

(a) Determine this function's  $y$ -intercept algebraically.

(b) Determine this function's  $x$ -intercept(s) algebraically. Be careful, these are a bit tricky in this problem.

3. Consider the piecewise linear function defined by  $y = \begin{cases} 4 - x & x < 2 \\ -\frac{1}{2}x + 1 & x \geq 2 \end{cases}$ .

(a) Accurately graph this function on the grid provided.

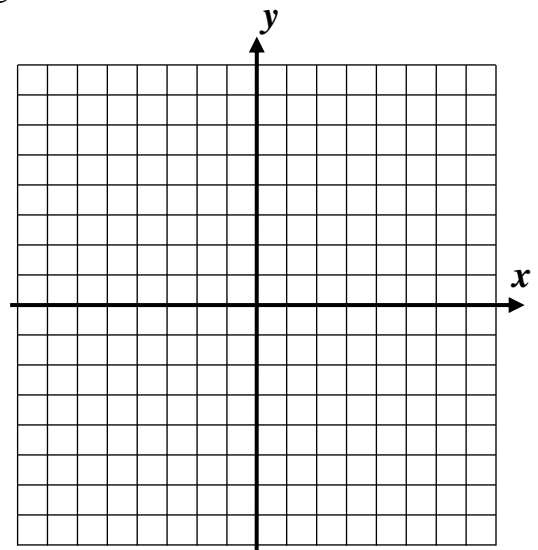


(b) State the domain of this function.

(c) State the range of this function.

4. Given the function  $f(x) = \begin{cases} -3 & x < 0 \\ 2 & 0 \leq x < 3 \\ 6 & x \geq 3 \end{cases}$  answer the following.

(a) Graph this function on the grid provided.



(b) What is this function's range. Watch out, this is tricky. Remember that the range represents the set of all outputs (y-values) of the function.

5. The function  $y = |x|$  is actually a piecewise linear function. Its graph is shown below. Write an piecewise equation that represents this function.

