

Functions/Regression – Piecewise Functions

- **piecewise function** → a function and its graph is broken into different parts (hence its name) and different functions are *defined on VARIOUS DOMAIN VALUES* (x-values).

Step # 1 → Evaluate the function based on its domain (x) values ; start with #'s after the word IF.

Step # 2 → Make a table of values (points) ; indicate if those points are closed or open dots.

Step # 3 → After graphing (by hand – calculator is not helpful), CHECK for one MAJOR FEATURE:
 Piecewise function's graphs should NOT CROSS EACH OTHER!

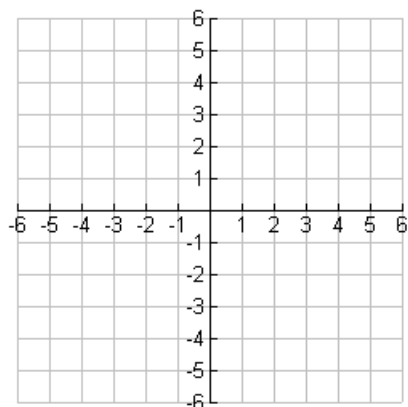
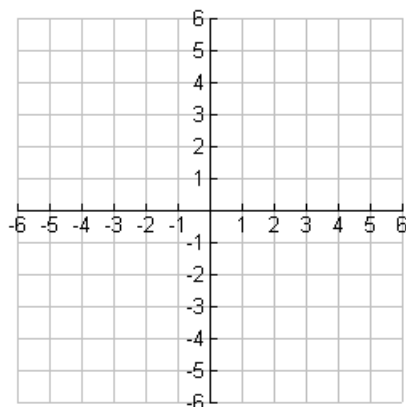
Example 1: Evaluate each piecewise function. Validate points with the function's given graph.

Given Piecewise Function	Graph of Piecewise Function	Evaluate/Complete Table of Values																		
a.) $f(x) = \begin{cases} x^2 + 2x - 3 & \text{if } x < 0 \\ x + 1 & \text{if } x \geq 0 \end{cases}$		<table> <tr> <th>x</th><th>Work to find f (x) or y</th><th>Pt (x,y)</th></tr> <tr> <td>-4</td><td></td><td></td></tr> <tr> <td>-2</td><td></td><td></td></tr> <tr> <td>0</td><td></td><td></td></tr> <tr> <td>1</td><td></td><td></td></tr> </table>	x	Work to find f (x) or y	Pt (x,y)	-4			-2			0			1					
x	Work to find f (x) or y	Pt (x,y)																		
-4																				
-2																				
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b.) $f(x) = \begin{cases} -1 & \text{if } x < -3 \\ - x + 5 & \text{if } -3 \leq x < 3 \cup x \neq 0 \\ 3x - 13 & \text{if } x \geq 3 \end{cases}$		<table> <tr> <th>x</th><th>Work to find f (x) or y</th><th>Pt (x,y)</th></tr> <tr> <td>4</td><td></td><td></td></tr> <tr> <td>-3</td><td></td><td></td></tr> <tr> <td>-5</td><td></td><td></td></tr> <tr> <td>3</td><td></td><td></td></tr> <tr> <td>0</td><td></td><td></td></tr> </table>	x	Work to find f (x) or y	Pt (x,y)	4			-3			-5			3			0		
x	Work to find f (x) or y	Pt (x,y)																		
4																				
-3																				
-5																				
3																				
0																				

Example 2: Make a table of domain values (“work”) and graph each piecewise function.

a.)
$$f(x) = \begin{cases} 2x + 3 & \text{if } x < -1 \\ 3 - x & \text{if } x \geq -1 \end{cases}$$

b.)
$$f(x) = \begin{cases} \frac{1}{2}|x| - 4 & \text{if } x \neq 0 \\ 3 & \text{if } x = 0 \end{cases}$$

[illegible][illegible]

Example 2 Cont'd: Make a table of domain values (“work”) and graph each piecewise function.

c.)
$$f(x) = \begin{cases} 3 & \text{if } x \leq -2 \\ 2x-1 & \text{if } -2 < x \leq 1 \\ 4-x & \text{if } x > 1 \end{cases}$$

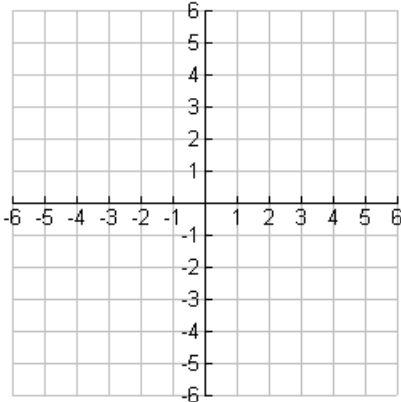


Table of Values	

d.)
$$f(x) = \begin{cases} -(x+2)^2 + 4 & \text{if } x < -1 \cup x \neq -2 \\ 1 & \text{if } x = -2 \\ 2\sqrt{x+1} - 2 & \text{if } x > -1 \end{cases}$$

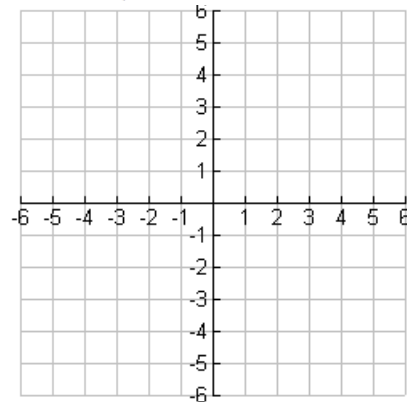


Table of Values	

Example 3: Complete the problem.

During a particular year, the taxes owed by a married person filing separately with an adjusted gross income of x dollars is given by the piecewise function below:

$$T(x) = \begin{cases} 0.15x & \text{if } 0 \leq x < 17,900 \\ 0.28(x - 17,900) + 2685 & \text{if } 17,900 \leq x < 43,250 \\ 0.31(x - 43,250) + 9783 & \text{if } x \geq 43,250 \end{cases}$$

Find and interpret: $T(70,000) + T(40,000)$

Example 4: Determine the domain and range of each piecewise graph in interval notation.

Example 4a	Example 4b	Example 4c	Example 4d
D: _____	D: _____	D: _____	D: _____
R: _____	R: _____	R: _____	R: _____