

2.2: Piecewise Functions

- I can graph a piecewise function
- I can evaluate values of a function given a piecewise function

VOCABULARY

Piecewise Function

Has at least 2 equations for different parts of the domain

Ex1: The table shows a recent income tax rate schedule. The amount of federal income tax an individual is required to pay is a function of taxable income.

If taxable income is over	But not over	The tax is:
\$0	\$7,825	10% of the amount over \$0
\$7,825	\$31,850	\$782.50 plus 15% of amount over \$7,825
\$31,850	\$77,100	\$4,386.25 plus 25% of amount over \$31,850
\$77,100	\$160,850	\$15,698.75 plus 28% of amount over \$77,100
\$160,850	\$349,700	\$39,148.75 plus 33% of amount over \$160,850
\$349,700	No limit	\$101,469.25 plus 35% of the amount over \$349,700

This can be written as a piecewise function.

Federal Tax Rate Schedule where x is the taxable income and $f(x)$ is the federal tax.

$$f(x) = \begin{cases} 0.1x & 0 < x \leq 7825 \\ 0.15(x - 7825) + 782.5 & 7825 < x \leq 31,850 \\ 0.25(x - 31,850) + 4,386.25 & 31,850 < x \leq 77,100 \\ 0.28(x - 77,100) + 15,698.75 & 77,100 < x \leq 160,850 \\ 0.33(x - 160,850) + 39,148.75 & 160,850 < x \leq 349,700 \\ 0.35(x - 349,700) + 101,469.25 & x > 349,700 \end{cases}$$

What is the tax for a taxable income of \$50,000? Of \$31,850?

$$f(50,000) = 0.25(50,000 - 31,850) + 4,386.25 = \$8,923.75$$

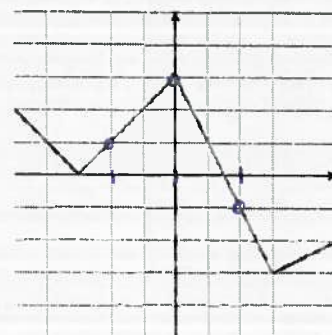
$$f(31,850) = 0.15(31,850 - 7,825) + 782.5 = \$4,386.25$$

Ex2: From the graph, evaluate the following:

a. $f(2) = -1$

b. $f(0) = 3$

c. $f(-2) = 1$



2.2 Piecewise Functions

Quick Check:

From the following piecewise function, find the following values:

$$f(x) = \begin{cases} -x+1, & \text{if } x < 1 \\ -2x-1, & \text{if } 1 \leq x < 4 \\ 2x-9, & \text{if } x \geq 4 \end{cases}$$

a. $f(4) = 2(4) - 9 = 8 - 9 = \boxed{-1}$

b. $f(0) = -(0) + 1 = \boxed{1}$

c. $f(-1) = -(-1) + 1 = 1 + 1 = \boxed{2}$

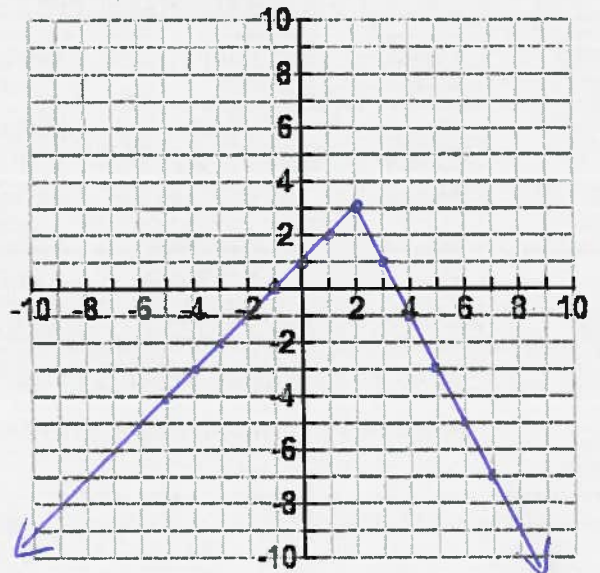
Graph the piecewise functions:

Ex3:

$$f(x) = \begin{cases} x+1 & \text{if } x \leq 2 \\ -2x+7 & \text{if } x > 2 \end{cases}$$

x	y
2	3
1	2
0	1
-1	0

x	y
2	3
3	1
4	-1
5	-3



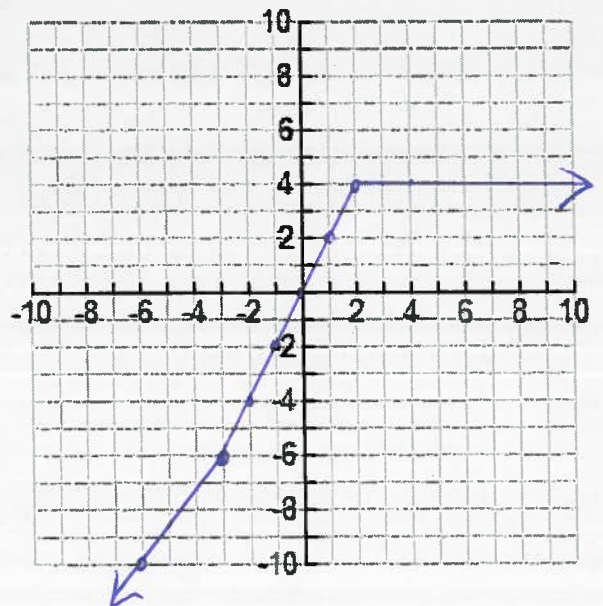
Ex4:

$$f(x) = \begin{cases} \frac{4}{3}x - 2, & x \leq -3 \\ 2x, & -3 < x \leq 2 \\ 4, & x > 2 \end{cases}$$

x	y
-3	-6
-6	-10
-9	-14

x	y
-3	-6
-2	-4
-1	-2
0	0
1	2
2	4

x	y
2	4
3	4
4	4



Do and Discuss:

A. True or False: The graphs of different parts of a piecewise function must connect.

B. Graph:

$$f(x) = \begin{cases} -\frac{1}{3}x - 2, & x < -3 \\ 2, & -3 \leq x < 1 \\ 4x - 2, & x \geq 1 \end{cases}$$

$-\frac{1}{3}x - 2$

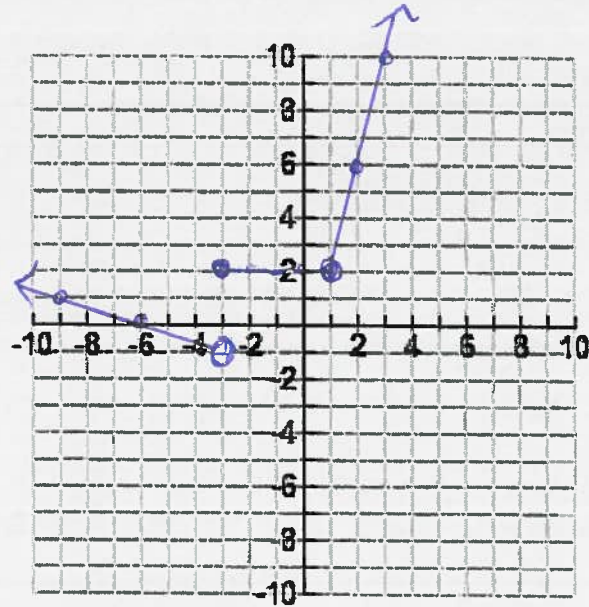
x	y
-3	-1
-6	0
-9	1

2

x	y
-3	2
-2	2
-1	2
0	2
1	2

$4x - 2$

x	y
1	2
2	6
3	10

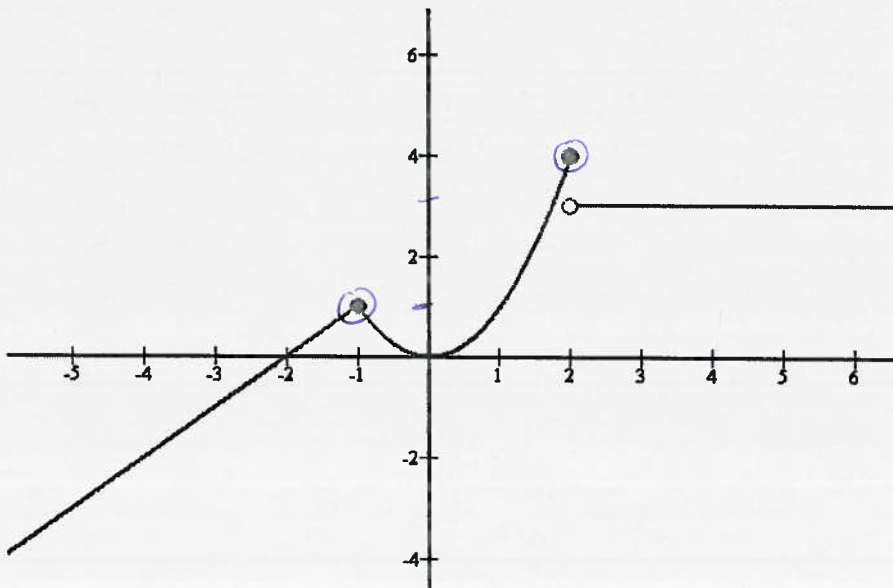


C. Use the graph to find:

a. $f(-1) = 1$

b. $f(2) = 2$

c. $f(4) = 3$



Additional Resources:

Graphing Piecewise functions: <https://www.khanacademy.org/math/algebra2/functions-and-graphs/piecewise-functions-tutorial/v/graphing-piecewise-function>

Evaluating Piecewise Functions: <https://www.khanacademy.org/math/algebra/algebra-functions/piecewise-functions/v/evaluating-piecewise-functions-example>

