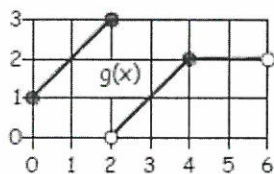


Lab 2: Piecewise Functions and Their Graphs

In this lab you will do several problems that will help you explore piecewise functions, as well as the relationship between functions and graphs in general. Do the problems neatly in pencil. Clearly lay out your work using proper notation. If you need more space, attach additional paper (if you do so, make sure you number your problems). If a problem involves algebraic work, circle/highlight/box your final answer. This lab is worth 40 points.

Task 1 (10 pts): The questions below relate to the following graph. The **entire graph** is that of $g(x)$.



- a) Is $g(x)$ a function? How do you know? Use one or more sentences.

Yes. It passes the vertical line test.

- b) What is the domain of $g(x)$? Use set-builder or interval notation, and express it as simply as possible.

$$\{x \mid 0 \leq x < 6\} \text{ or } [0, 6)$$

- c) What is the range of $g(x)$? Use set-builder or interval notation, and express it as simply as possible.

$$\{y \mid 0 < y \leq 3\} \text{ or } (0, 3]$$

- d) Write an algebraic expression for $g(x)$ as a piecewise function by filling in the missing expressions:

$$g(x) = \begin{cases} x+1 & \text{if } 0 \leq x \leq 2 \\ x-2 & \text{if } 2 < x \leq 4 \\ 2 & \text{if } 4 < x < 6 \end{cases}$$

line 1: slope 1, y-intercept 1

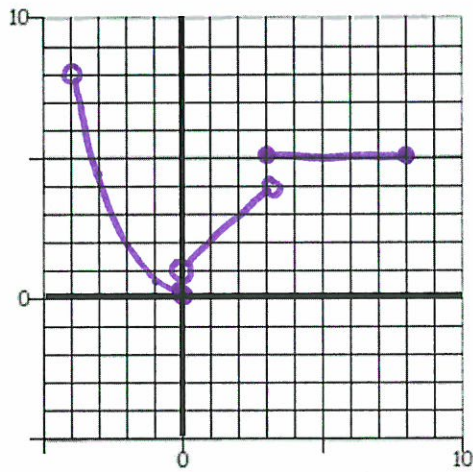
line 2: slope 1, would hit y-axis at -2
if extended

line 3: horizontal line $y=2$

Task 2 (10 pts): Graph $f(x) = \begin{cases} 0.5x^2 & \text{if } -4 < x \leq 0 \\ x + 1 & \text{if } 0 < x < 3 \\ 5 & \text{if } 3 \leq x \leq 8 \end{cases}$

$$< = \circ$$

$$\leq = \bullet$$



x	$0.5x^2$
-4	8
-3	4.5
-2	2
-1	0.5
0	0

x	$x+1$
0	1
1	2
2	3
3	4

Task 3 (8 pts): Below is a graph of the piecewise function $y = f(x)$.

- a) What is the domain of this function? Use set-builder or interval notation, and express it as simply as possible.

$$\{x \mid -6 \leq x \leq 6\} \text{ or } [-6, 6]$$

- b) What is the range of this function? Use set-builder or interval notation, and express it as simply as possible.

$$\{y \mid -4 \leq y \leq 4\} \text{ or } [-4, 4]$$

- c) What is $f(0)$?

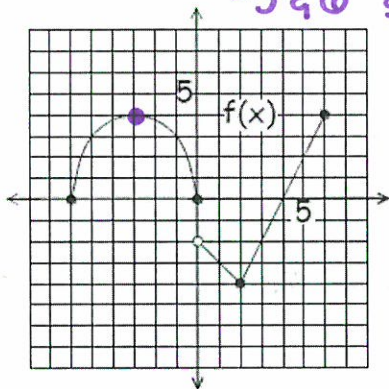
0 since $(0, 0)$ is on the graph, but $(0, -2)$ isn't

- d) For what x-value(s) is $f(x) = -2$?

3 since $(3, -2)$ is on the graph, \nearrow

- e) For what x-value(s) is $f(x) = 4$?

$-3 \notin 6$ since both $(-3, 4)$ & $(6, 4)$ are on the graph



Task 4 (12 pts): Kevin's job pays \$9/hour up to 40 hours, and time-and-a-half (i.e., 1.5 times his normal wage) for overtime.

↪ so, \$13.50/hr

- a) How much will Kevin make in a week if he works 30 hours?

$$30 \cdot 9 = \boxed{\$270}$$

- b) How much will Kevin make in a week if he works 50 hours?

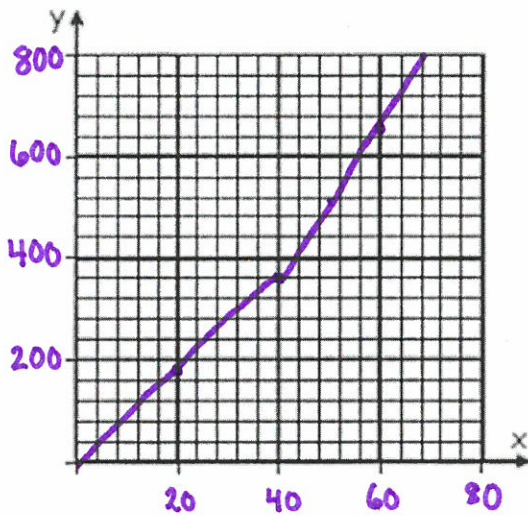
$$40 \cdot 9 + 10 \cdot 13.50 = \boxed{\$495}$$

- c) Write an algebraic expression for $P(x)$, his weekly pay for working x hours, as a piecewise function (it will have two pieces).

$$P(x) = \begin{cases} 9x & \text{if } 0 \leq x \leq 40 \\ 360 + 13.5(x - 40) & \text{if } x > 40 \end{cases}$$

- d) Graph $P(x)$ below. Indicate the scale of your axes. Make sure you choose an appropriate scale so you can graph both pieces.

↑ reg. pay ↑ overtime pay



x	9x
0	0
20	180
40	360

x	360 + 13.5(x - 40)
40	360
60	630
80	900

