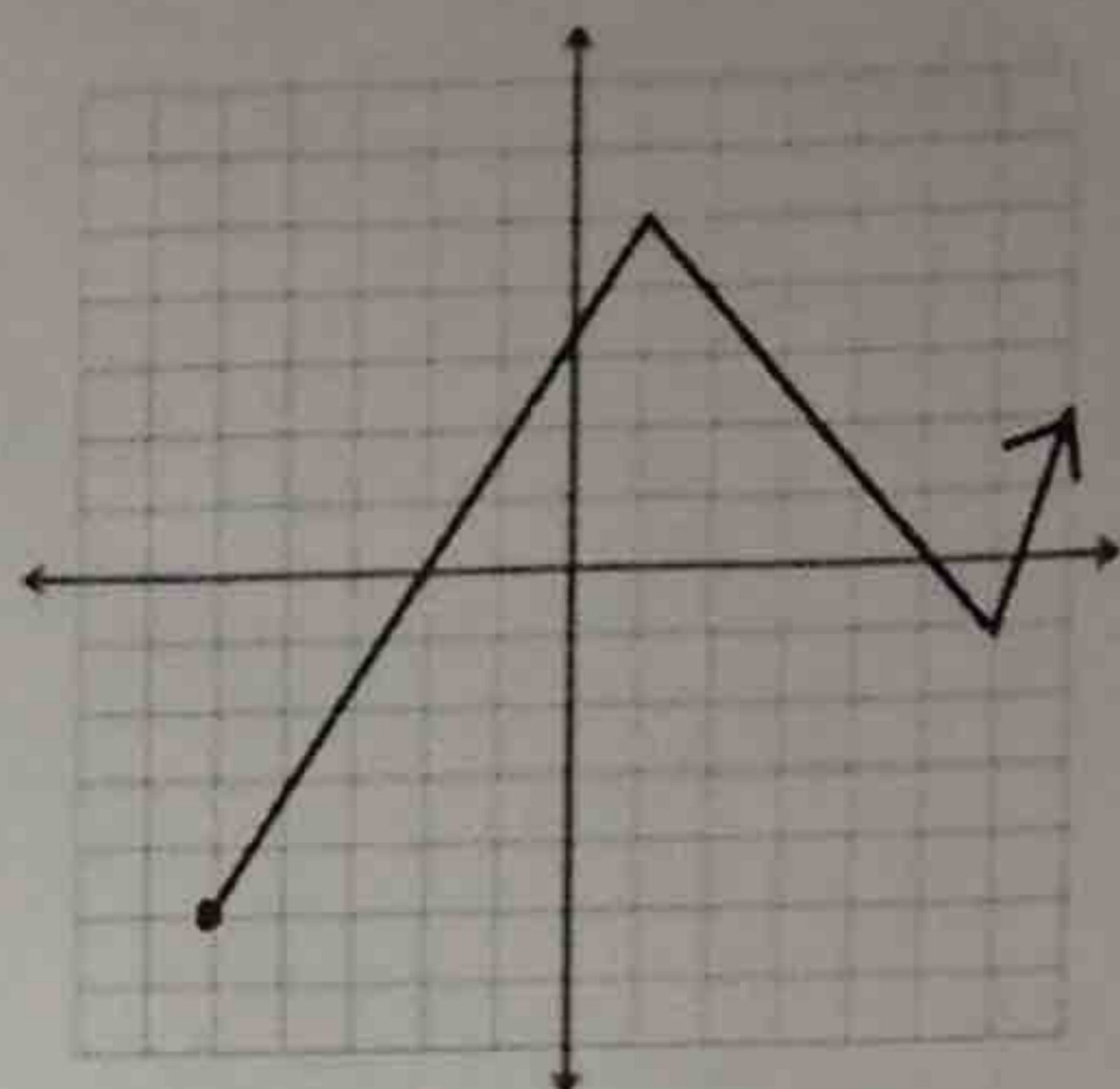# Unit 2: Functions and Their Inverses

Math 3

Name: **Key!**

Study Guide

1. Identify the following from the graph shown below.

   a. Domain: $[-5, \infty)$

   b. Range: $[-5, \infty)$

   c. X-intercept(s): $(-2, 0) \cdot (5, 0) \ (6.1, 0)$

   d. Y-intercept(s): $(0, 3.5)$

   e. Intervals increasing: $(-5, 1) \cup (6, \infty)$

   f. Intervals decreasing: $(1, 6)$

2. State the parent function and the transformations for each of the following:

   a. $f(x) = x^2 - 1$

   PF: Quadratic $y = x^2$

   Trans: Down 1

   b. $g(x) = 2|x-1|$

   PF: Absolute value $y = |x|$

   Trans: Stretch, Right 1

   c. $h(x) = |x+5| - 2$

   PF: Absolute value $y = |x|$

   Trans: Left 5, Down 2

   d. $j(x) = -3\sqrt{x}$

   PF: Square root $y = \sqrt{x}$

   Trans: reflect over x, stretch

3. Write the equation of the function with the given transformations:

   a. Square root: left 3, down 2

   b. Absolute value: reflection over y-axis, compression of ½

   c. Quadratic: reflection over x-axis, right 9

   d. Cubic: down ¼

   3a. $f(x) = \sqrt{x+3} - 2$

   3b. $f(x) = \frac{1}{2}|-x|$

   3c. $f(x) = -(x-9)^2$

   3d. $f(x) = x^3 - \frac{1}{4}$

Directions: Write a piecewise function for the following graphs.

4.

5.

6.
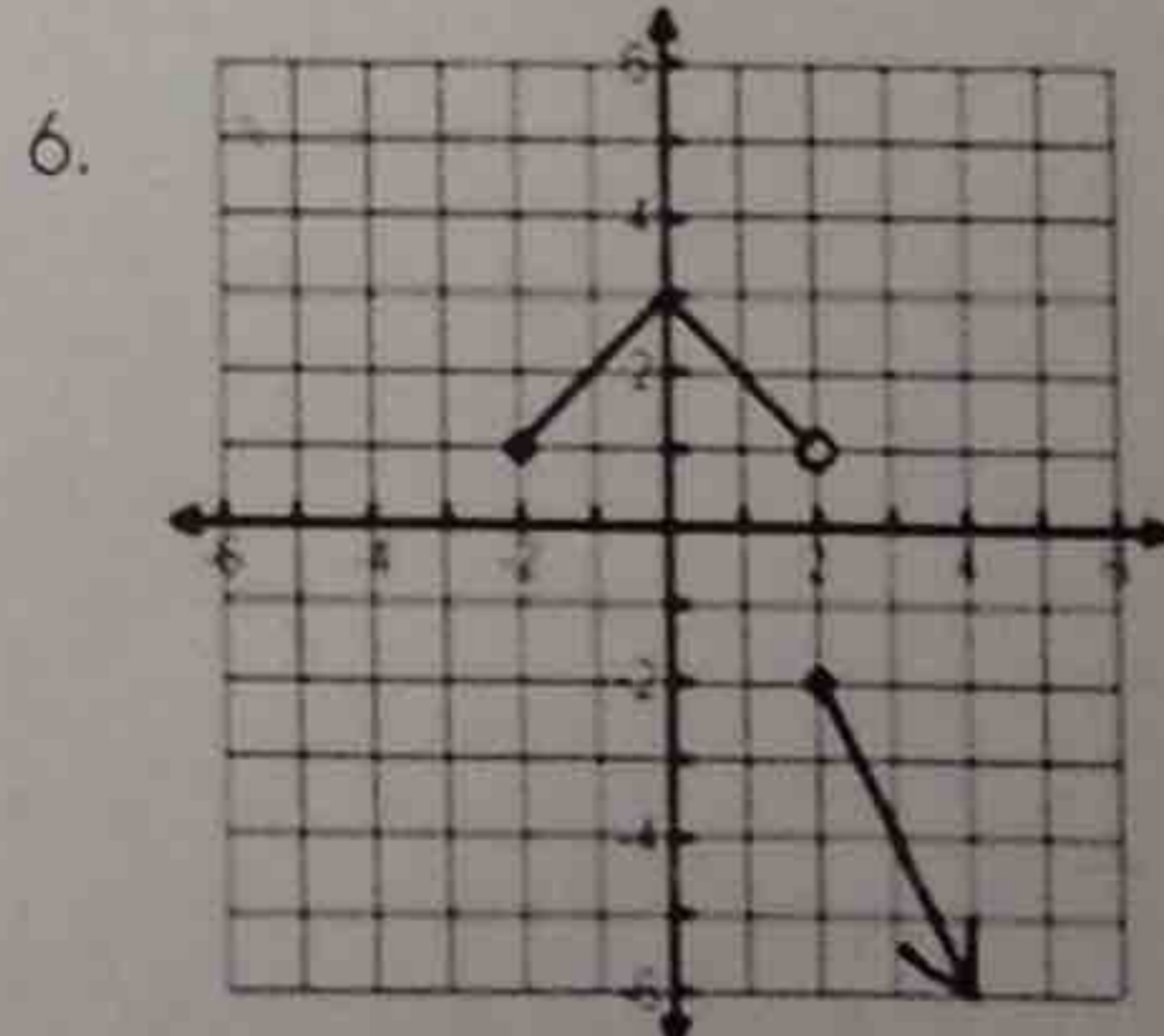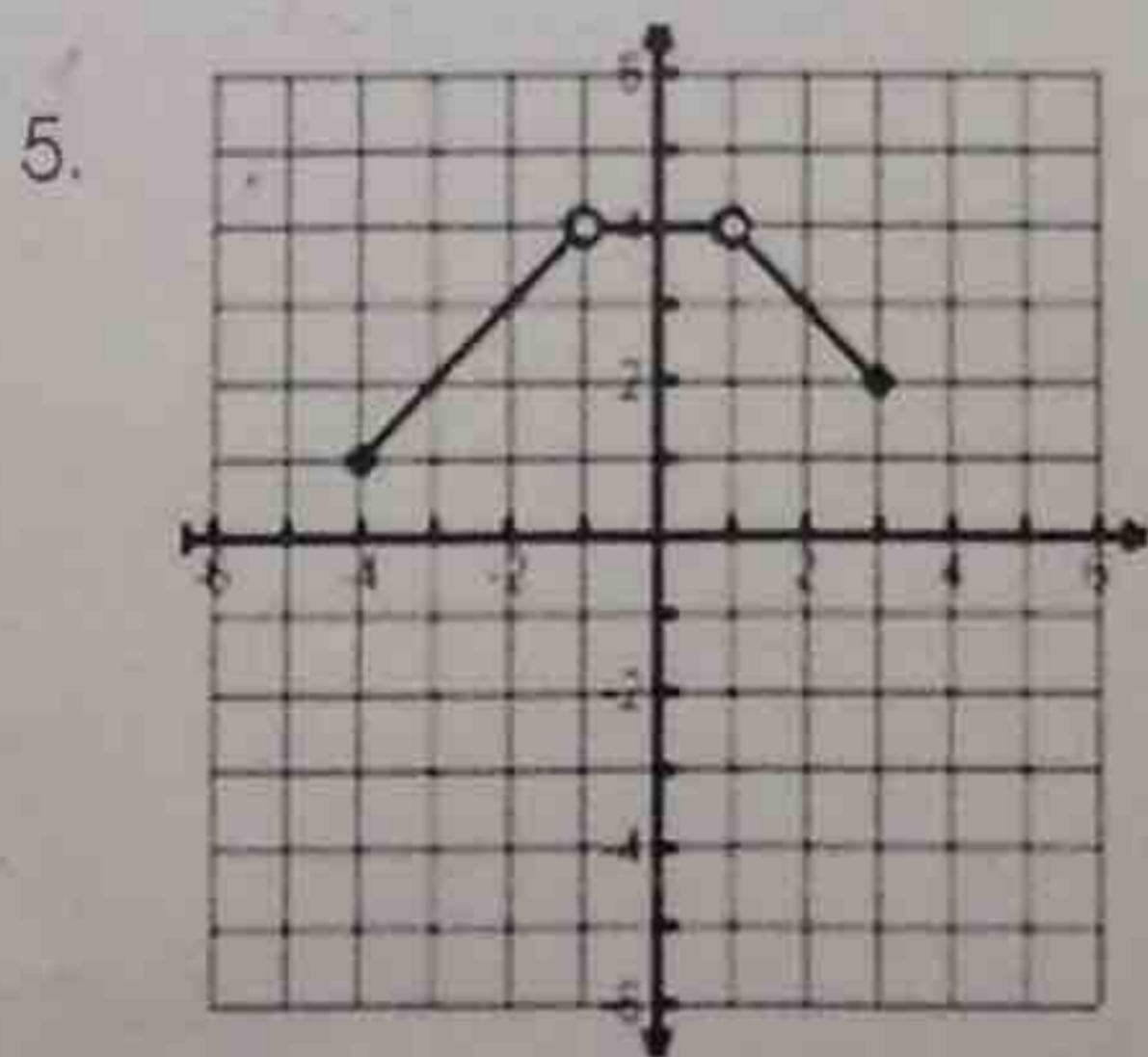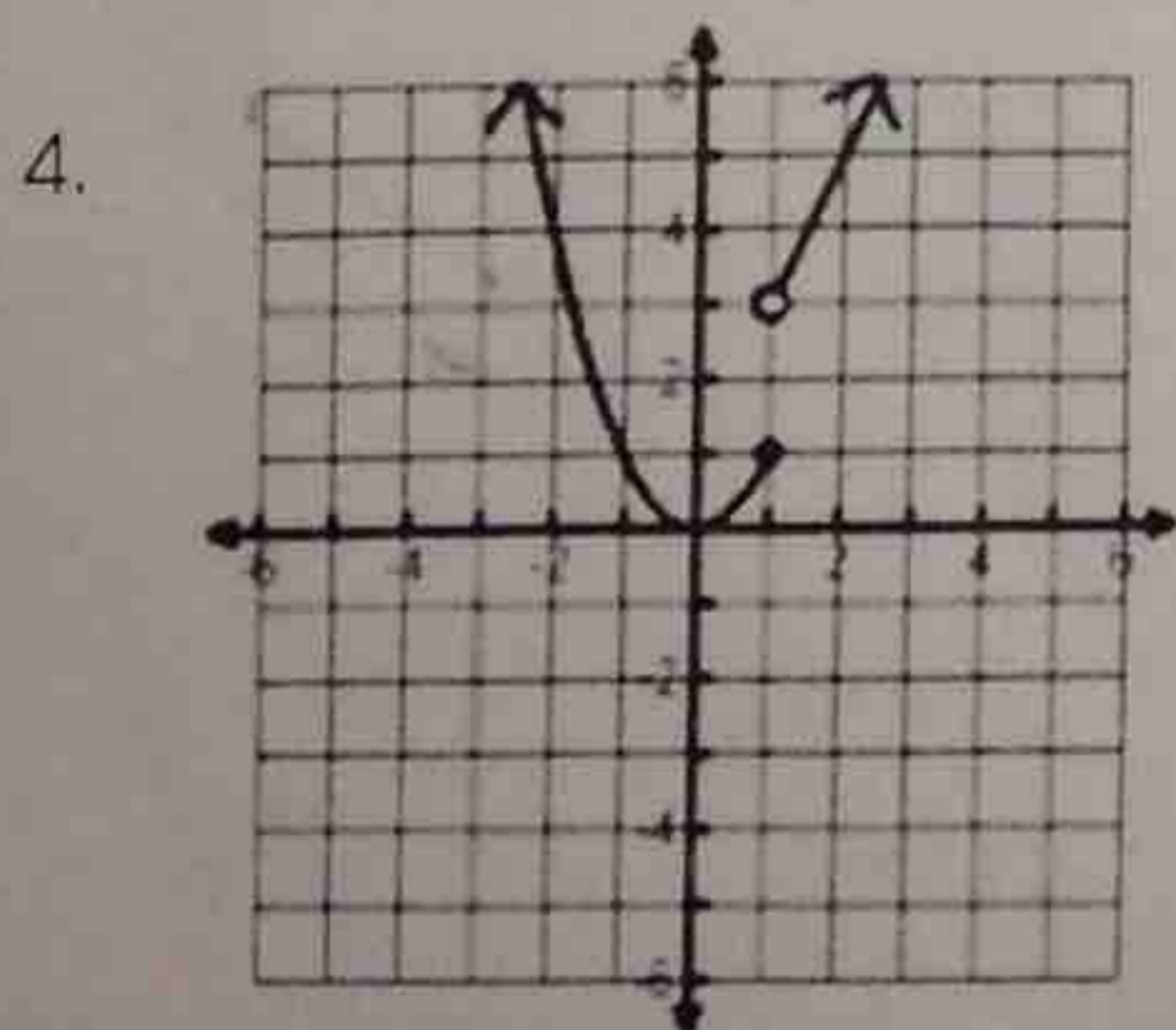
$$f(x) = \begin{cases} x^2, & x \le 1 \\ \\ 2x+1, & x > 1 \end{cases}$$

$$f(x) = \begin{cases} x+5, & -4 \le x < -1 \\ 4, & -1 < x < 1 \\ -x+5, & 1 < x \le 3 \end{cases}$$

$$f(x) = \begin{cases} -|x|+3, & -2 \le x < 2 \\ -2x+2, & x \ge 2 \end{cases}$$

Directions: Carefully graph each of the following. Identify whether or not the graph is a function. Then, evaluate the graph at any specified domain value. You may use your calculators to help you graph, but you must sketch it carefully on the coordinate plane!
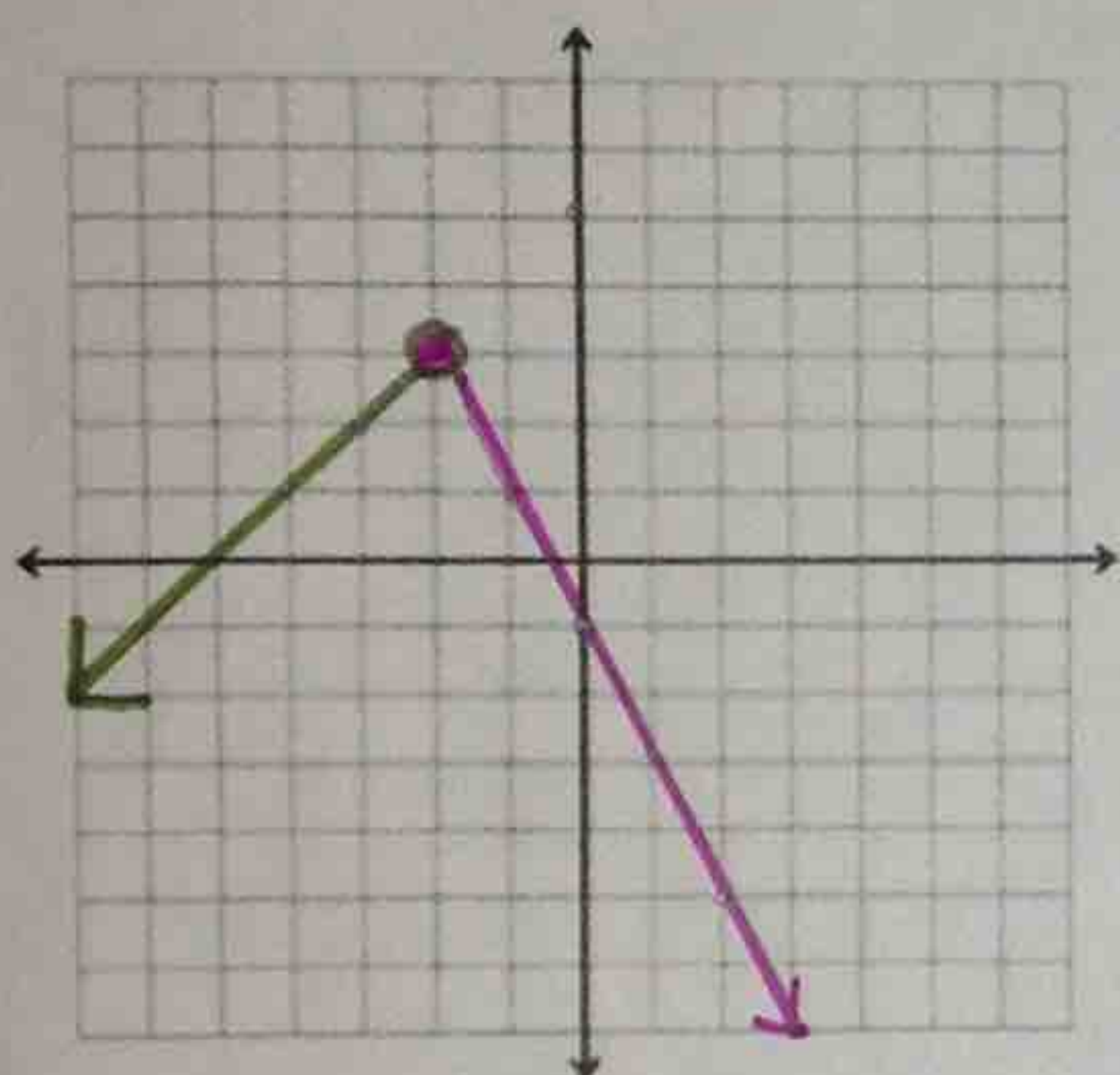
7. $f(x) = \begin{cases} x+5 & x<-2 \\ -2x-1 & x \geq -2 \end{cases}$

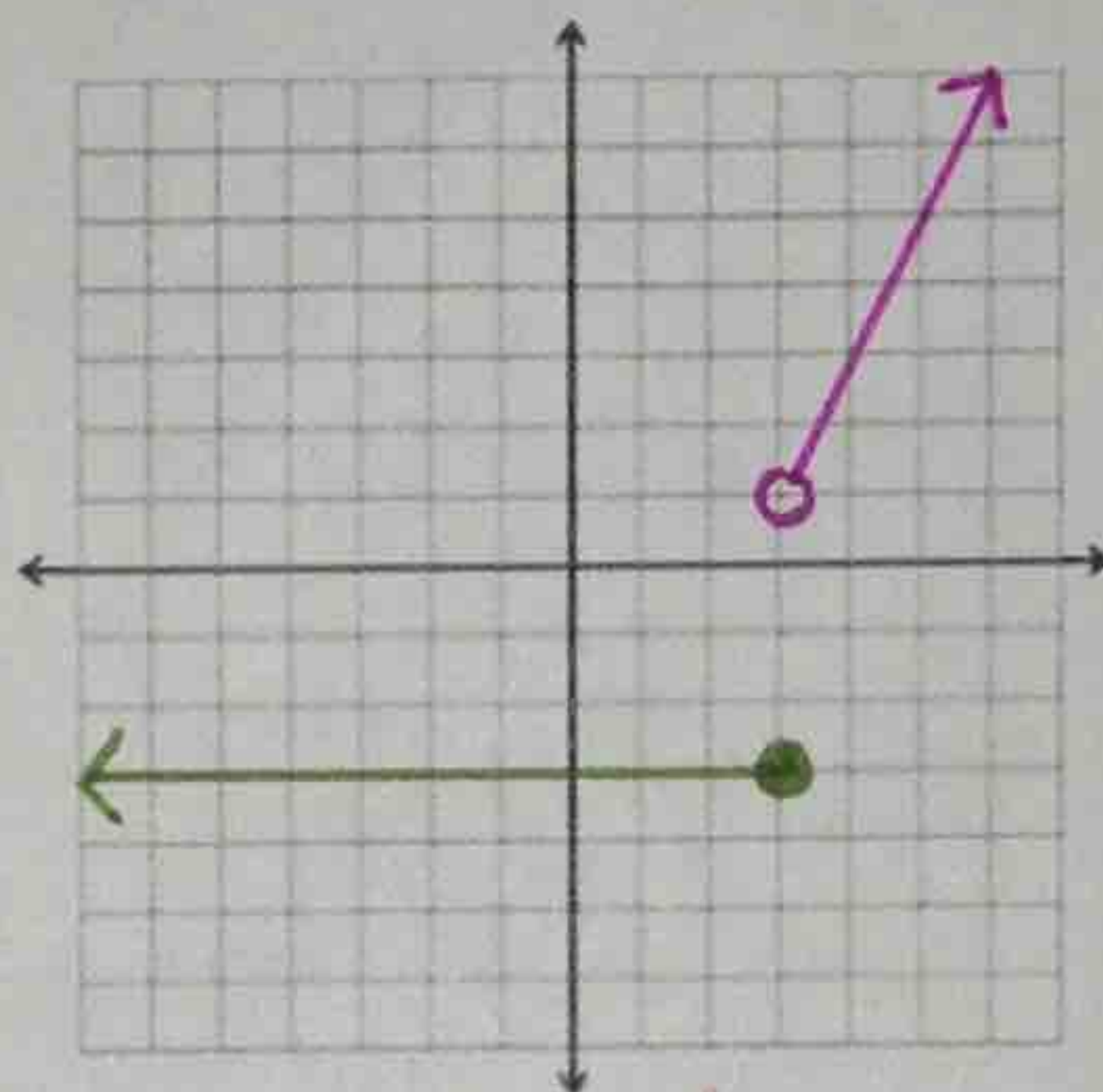Function? (Yes) or No

$f(3) = -7$

$f(-4) = 1$

$f(-2) = 3$

8. $f(x) = \begin{cases} -3 & x \leq 3 \\ 2x-5 & x>3 \end{cases}$

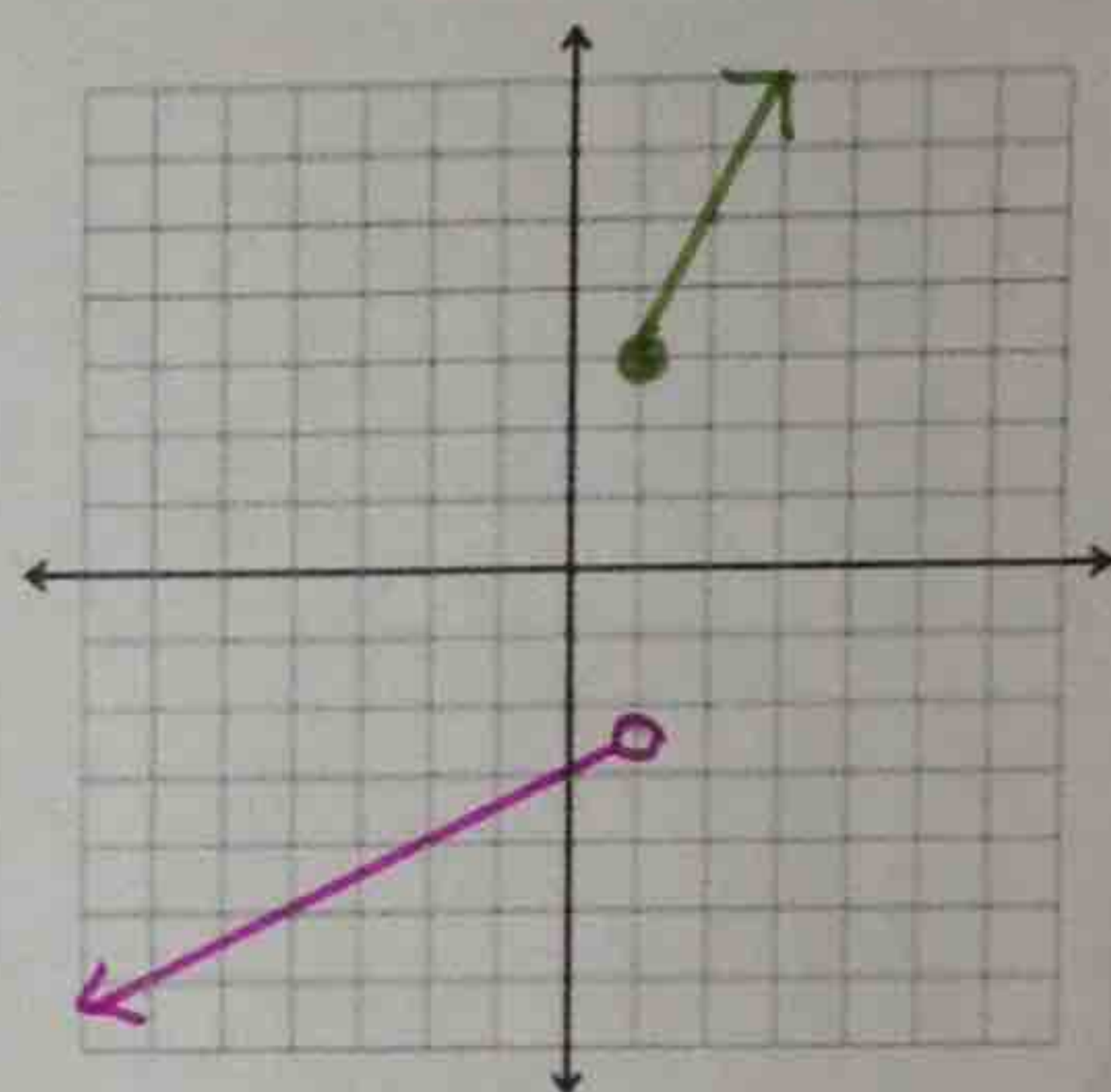Function? (Yes) or No

$f(-4) = -3$

$f(0) = -3$

$f(3) = -3$

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

Function? (Yes) or No
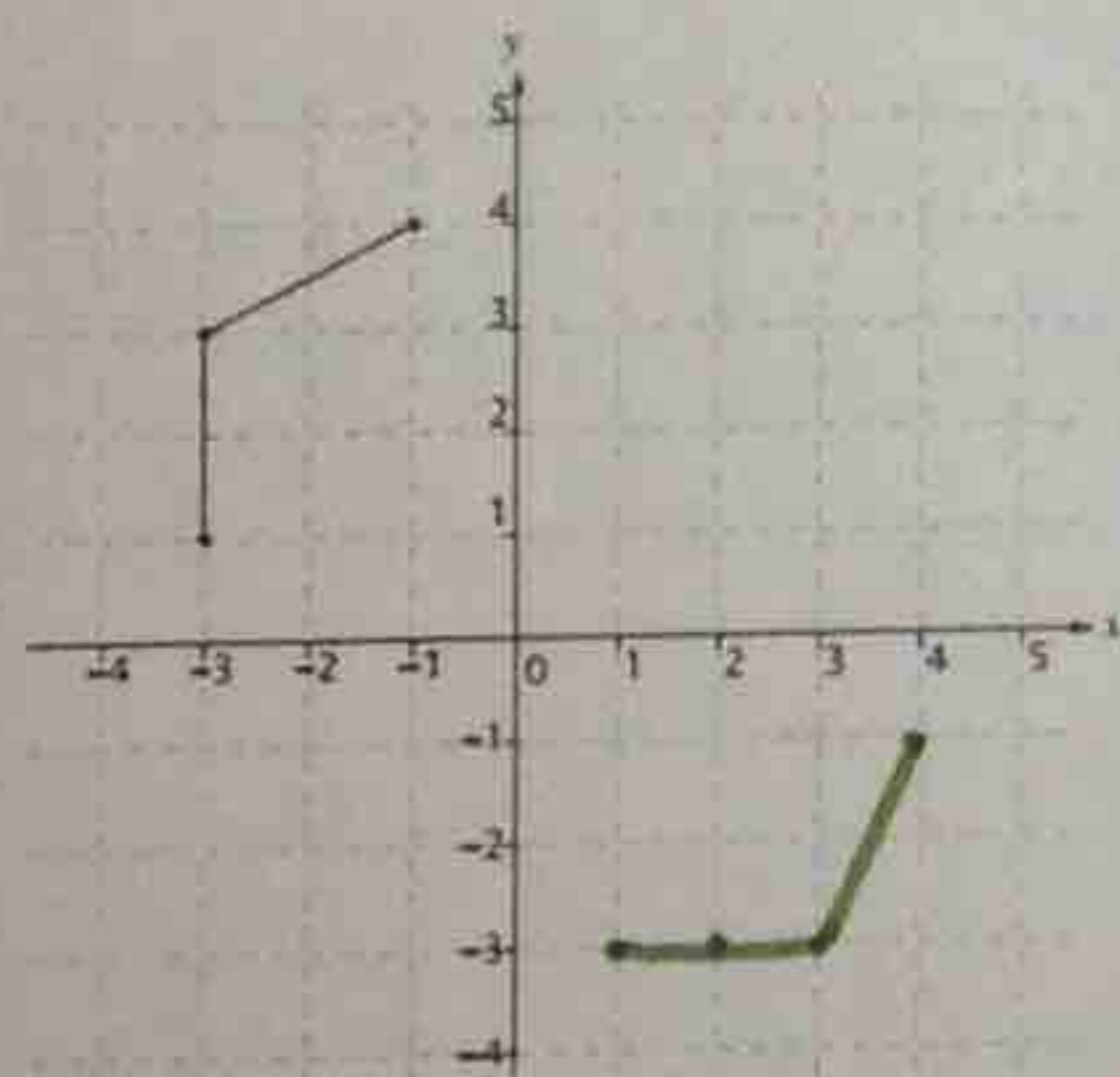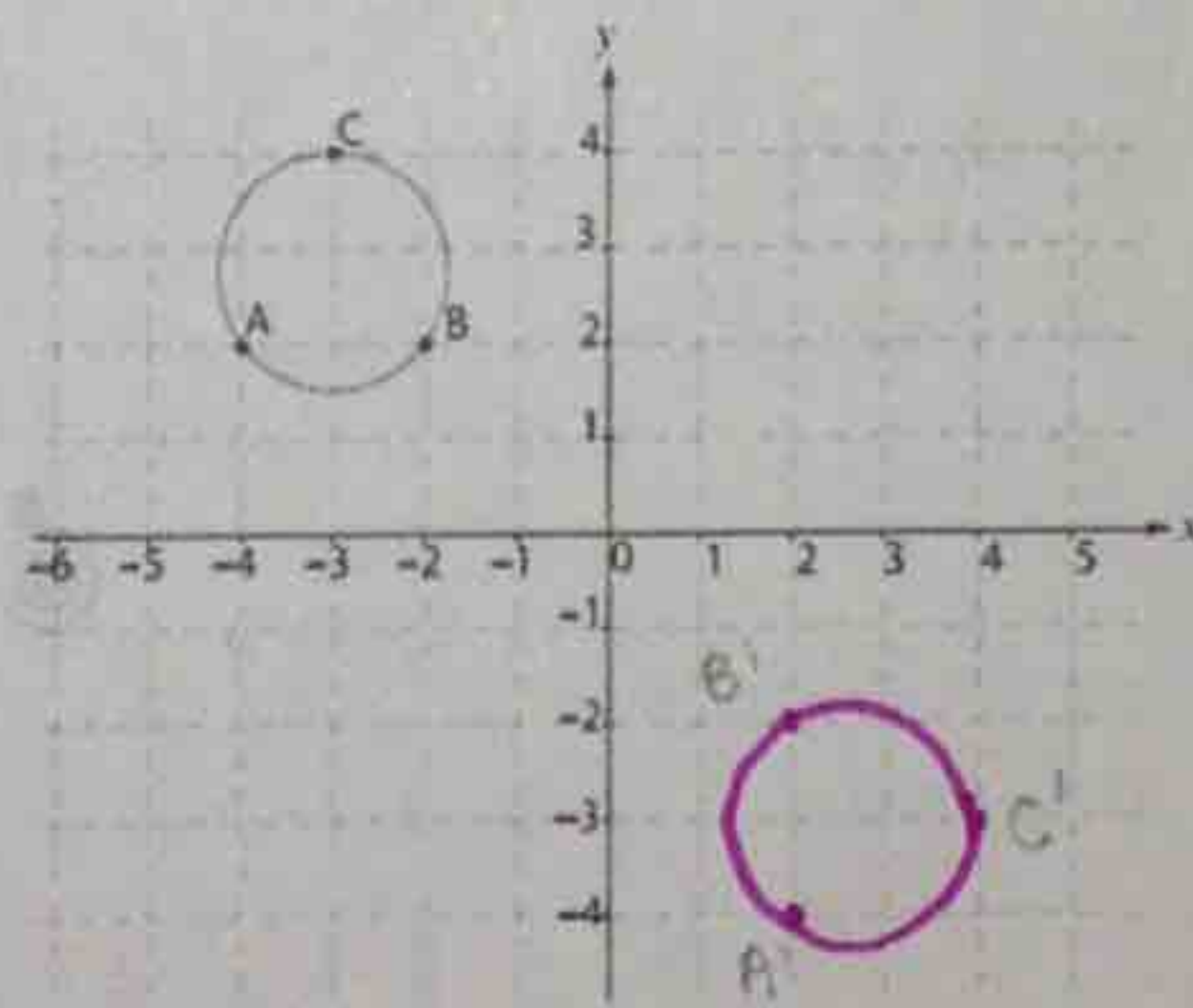
$f(-2) = -4$

$f(6) = 13$

$f(1) = 3$

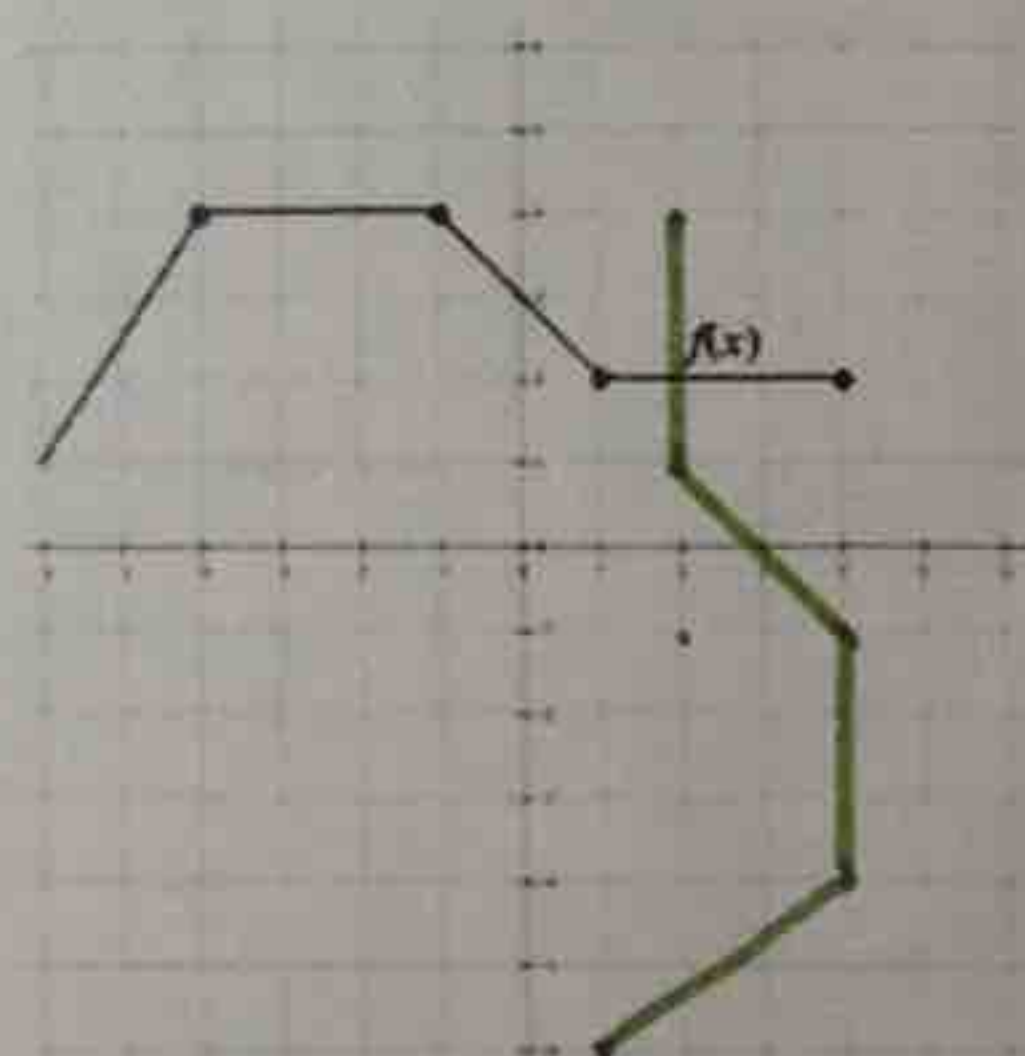**Directions:** Graph the inverse of the following graphs on the same coordinate plane.

10.

11.

12.

Directions: Find the inverse of the following functions. Is the function 1-1?

13. $f(x) = 2x - 3$ 　 yes, 1-1

$x = 2y - 3$

$x + 3 = 2y$

$\frac{x+3}{2} = y$

$f^{-1}(x) = \frac{x+3}{2}$

14. $f(x) = \frac{x-5}{x}$ 　 yes, 1-1

$x = \frac{y-5}{y}$

$yx = y - 5$

$yx - y = -5$

$y(x-1) = -5$

$f^{-1}(x) = \frac{-5}{x-1}$

15. $f(x) = 5x^2 - 4$ 　 NO, not 1-1

$x = 5y^2 - 4$

$x + 4 = 5y^2$

$\frac{x+4}{5} = y^2$

$\pm\sqrt{\frac{x+4}{5}} = y$

$f^{-1}(x) = \pm\sqrt{\frac{x+4}{5}}$