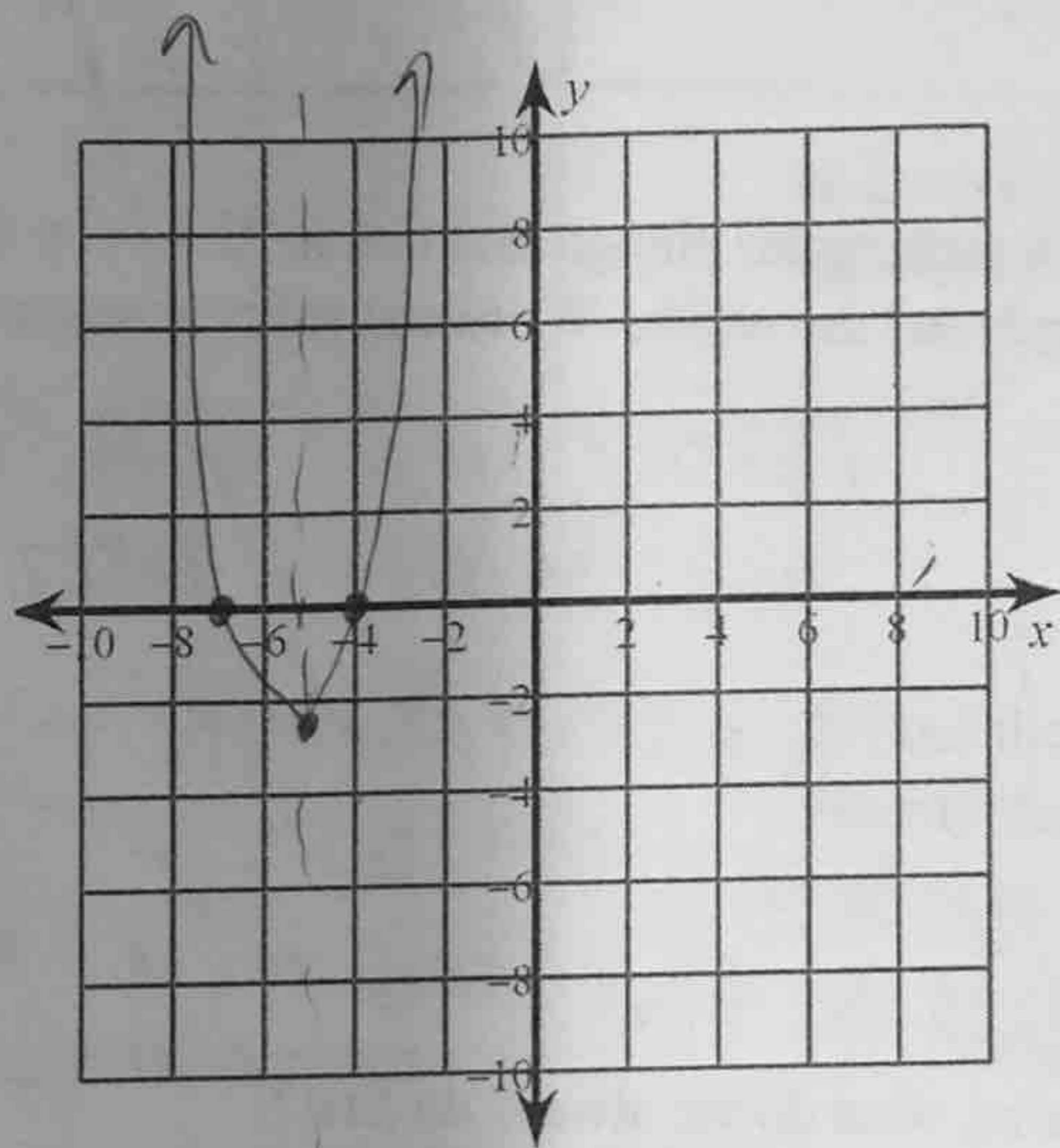


SM3 Unit 2 Review Sheet

You must complete this worksheet. You may use your notes. You will see these questions again. If you can do this worksheet, the test is going to be CAKE!!!

1. Given $f(x) = x^2 + 11x + 28$, graph the function, label and identify the axis of symmetry, the vertex and the y-intercept.



$$x = \frac{-b}{2a} = \frac{-11}{2} = -5.5$$

$$(x+7)(x+4) = 0$$


$$x = -7, -4 \text{ zeros}$$

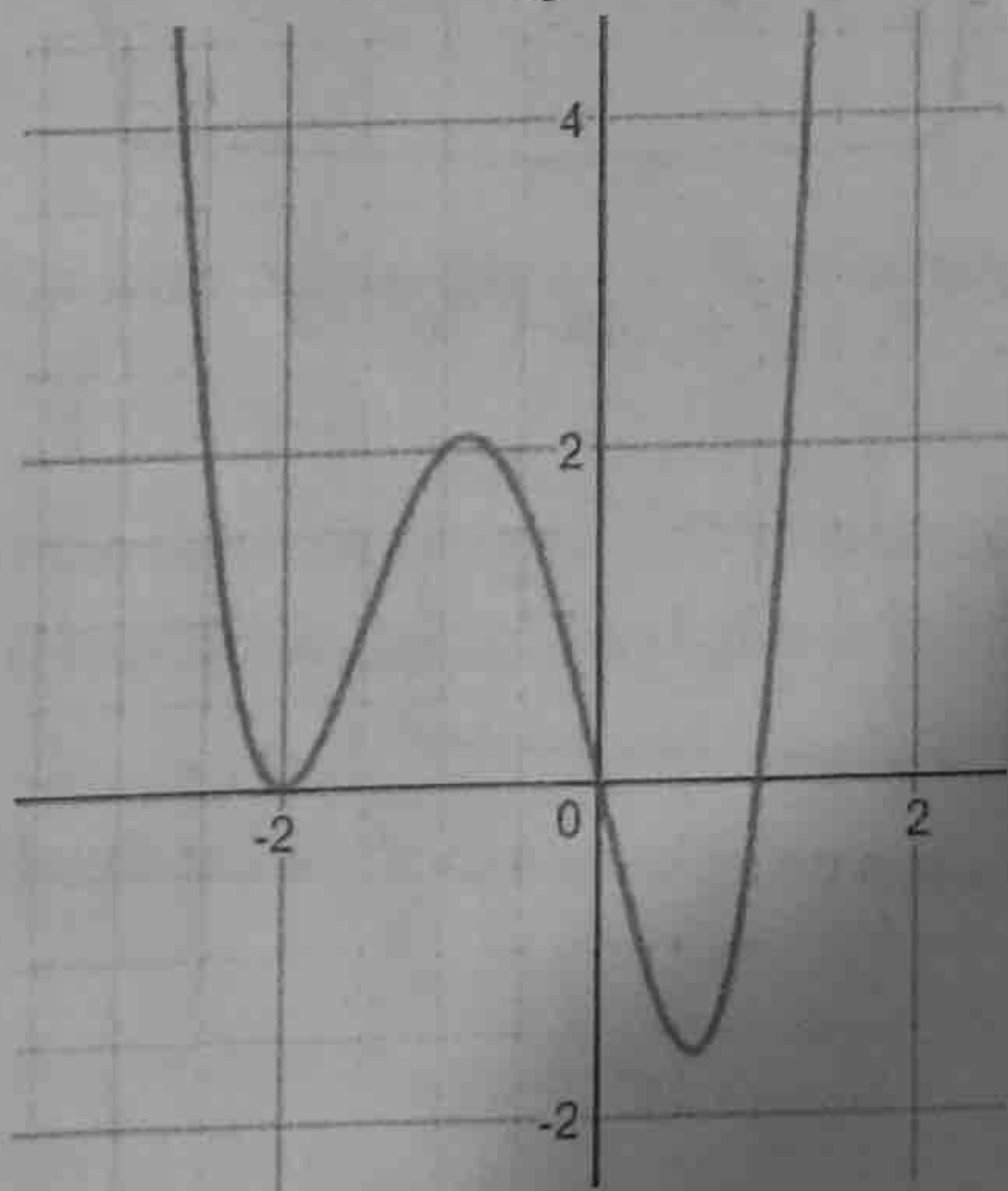
$$\checkmark \text{ axis of sym } x = -5.5$$

$$\checkmark \text{ Vertex } (-5.5, -2.25)$$

$$0^2 + 11(0) + 28 = 28$$

$$y\text{-intercept is } (0, 28)$$

2. Given the function $g(x)$ below. For which interval is the function positive or zero ($g(x) \geq 0$)? Be  very careful with your interval notation.

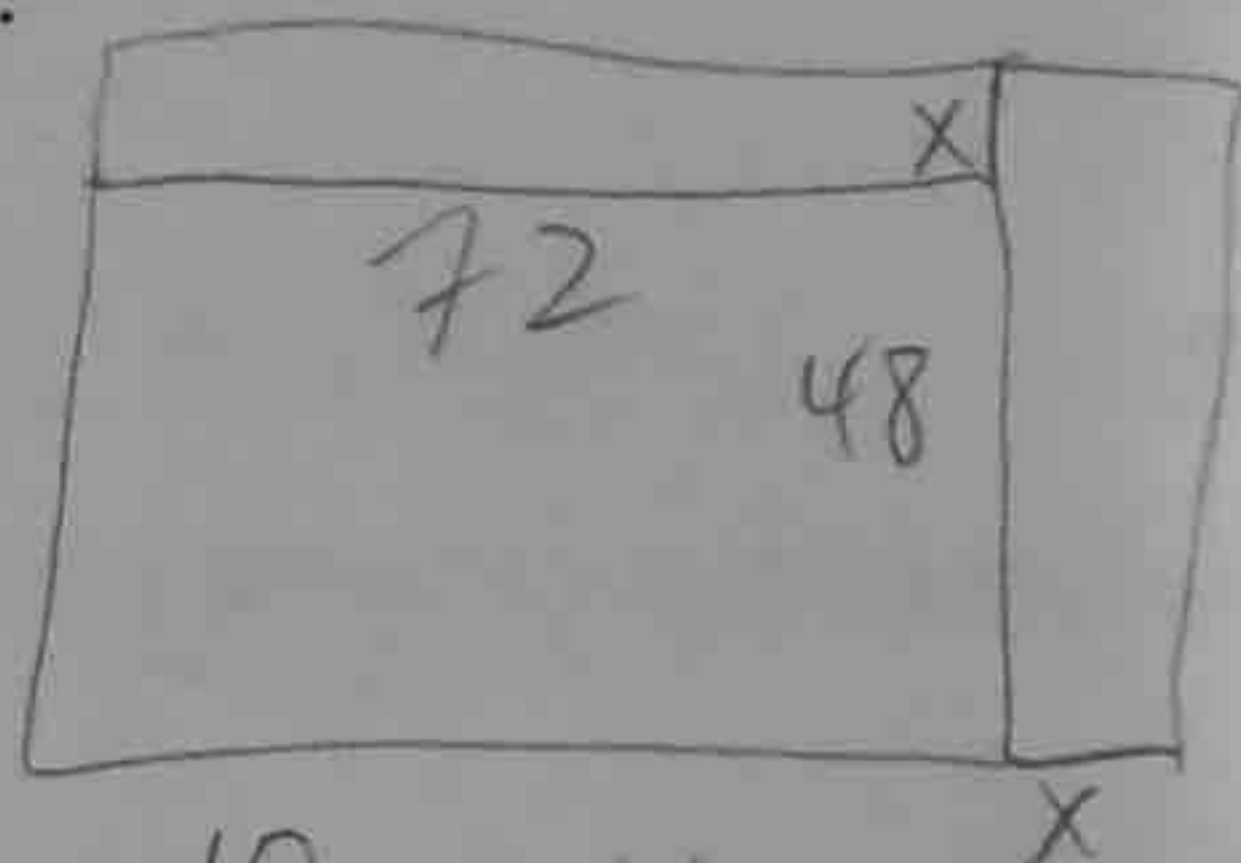


$$(-\infty, 0] \cup [1, \infty)$$

3. Evaluate $h(3t + 7)$ for the function $h(x) = -2\sqrt{3x - 2} + 7$. Simplify your answer.

$$\begin{aligned} h(3t+7) &= -2\sqrt{3(3t+7)-2} + 7 \\ &= -2\sqrt{9t+21-2} + 7 \\ &= -2\sqrt{9t+19} + 7 \end{aligned}$$

4. A city wants to double the area of a rectangular playground that is 72 feet by 48 feet by adding the same distance x to the length and the width. Write and solve an equation to find the value of x .



$$(72+x)(48+x) = (72)(48)(2)$$

$$(x+72)(x+48) = 6912$$

$$y_1 = (x+72)(x+48)$$

$$y_2 = 6912$$

Find intersect: $x = 24 \text{ ft}$

$$\begin{aligned} X_{\min} &= -10 \\ X_{\text{set}} &= 10 \\ X_{\max} &= 50 \end{aligned}$$

$$\begin{aligned} y_{\min} &= -10 \\ y_{\text{set}} &= 10000 \\ y_{\max} &= 80000 \end{aligned}$$

Factor each completely. When factoring what do we always do first?

5. $20x^2 - 45$

$$5(4x^2 - 9)$$

$$5(2x-3)(2x+3)$$

$$\begin{array}{r} -252 \\ (21x-7) \\ \cdot \\ + \\ -19 \end{array}$$

6. $21x^2 - 19x - 12$

$$\begin{array}{r} 3 \cdot 7 \quad -28 \quad 3 \cdot 4 \\ \quad \quad \quad +9 \end{array}$$

$$(3x-4)(7x+3)$$

7. $7x^2 - 28x$

$$7x(x-4)$$

8. $4x^2 + 24x + 36$

$$4(x^2 + 6x + 9)$$

$$4(x+3)^2$$

Factor the polynomials over the complex numbers. (What is a complex number? What should be in your answer?)

9. $121x^2 + 49$

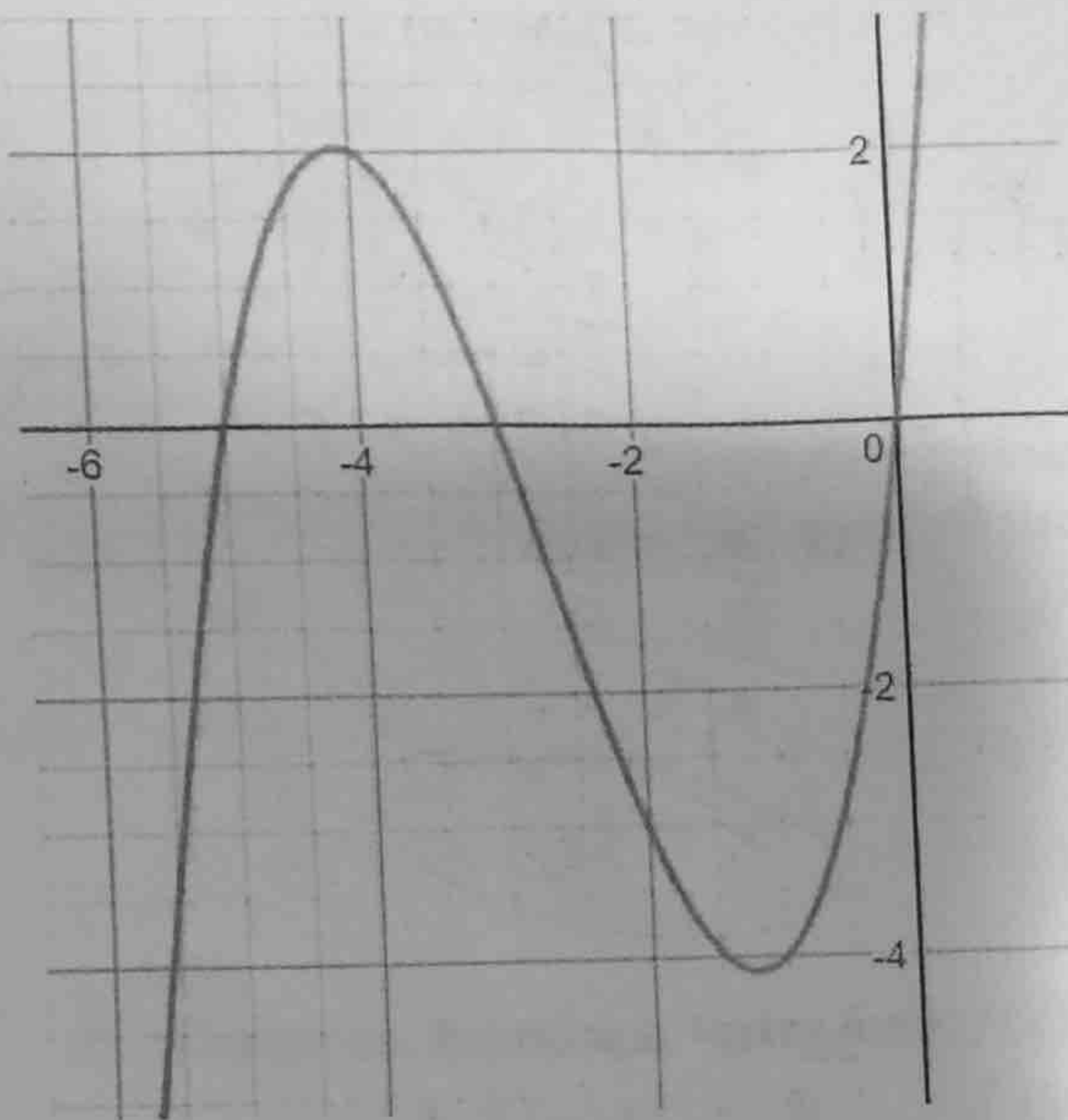
$$(11x+7i)(11x-7i)$$

10. $192x^2 + 27$

$$3(64x^2 + 9)$$

$$3(8x+3i)(8x-3i)$$

11. Use the graph below to answer the questions.



A. On what interval(s) is the function decreasing?

$(-4; 1.5)$

B. On what interval(s) is the function increasing?

$(-\infty, -4) \cup (-1.5, \infty)$

C. Find the extrema of the function and identify them as relative or absolute.

rel max $(-4, 2)$

rel min $(-1.5, -4.1)$

D. Identify the zeros of the function.

Zeros $(-5, 0), (-3, 0), (0, 0)$

E. On what interval(s) is the function positive?

$(-5, -3) \cup (0, \infty)$

F. On what interval(s) is the function negative?

$(-\infty, -5) \cup (-3, 0)$

Find the value that would complete the square and then factor it into a perfect square. Read the instructions carefully and please follow them. Check out the bold type. 😊

12. $x^2 - 11x + \boxed{121/4} \rightarrow \boxed{\left(x - \frac{11}{2}\right)^2}$

$\frac{2xy}{2x} = \frac{-11x}{2x} \quad y = -\frac{11}{2} \quad y^2 = \frac{121}{4}$

13. $3x^2 + 21x + \boxed{49/4} \rightarrow \boxed{3\left(x + \frac{7}{2}\right)^2}$

$\frac{7x}{2x} = \frac{21x}{2x} \quad 3\left(x^2 + 7x + \frac{49}{4}\right)$

$\frac{49}{4} \cdot 3$

14. $2x^2 + 18x + \boxed{81/2} \rightarrow \boxed{2\left(x + \frac{9}{2}\right)^2}$

$\frac{9x}{2x} = \frac{18x}{2x} \quad 2\left(x^2 + 9x + \frac{81}{4}\right)$

$\frac{9x}{2x} = \frac{18x}{2x} \quad \frac{9}{2} = y \quad y^2 = \frac{81}{4}$

Solve the following equations. Use any method you want.

15. $16 = 38x - 12x^2$ $a=6$
 $12x^2 - 38x + 16 = 0$ $b=-19$
 $2(6x^2 - 19x + 8) = 0$ $c=8$

$$x = \frac{-(-19) \pm \sqrt{19^2 - (4 \cdot 6 \cdot 8)}}{2(6)} = \frac{19 \pm 13}{12}$$
 $\rightarrow \frac{32}{12} = \frac{8}{3}$
 $\rightarrow \frac{6}{12} = \frac{1}{2}$

16. $3x^2 - 24x - 48 = 0$
 $3(x^2 - 8x - 16) = 0$

$$\frac{8 \pm \sqrt{64 - (4 \cdot 1 \cdot -16)}}{2} = \frac{8 \pm \sqrt{128}}{2}$$

$$\frac{4 \pm 4\sqrt{2}}{2} \leftarrow \frac{8 \pm 8\sqrt{2}}{2}$$

17. $20x^2 - 13x - 21 = 0$
 $4 \cdot 5 \quad 15 \quad 3 \cdot 7$
 -28

$(4x+3)(5x-7)$

$\frac{-3}{4}, \frac{7}{5}$

19. $\frac{3(x+1)^2}{3} = \frac{81}{3}$

$\sqrt{(x+1)^2} = \sqrt{27}$

$x+1 = \pm 3\sqrt{3}$

$x = -1 \pm 3\sqrt{3}$

18. $\frac{3x^2}{3} = \frac{108}{3}$

$\sqrt{x^2} = \sqrt{36}$

$x = \pm 6$

20. $9x^2 = -6x - 1$

$9x^2 + 6x + 1$

$(3x+1)(3x+1)$

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

21. $\frac{2(x-7)^2}{2} = \frac{16}{2}$

$\sqrt{(x-7)^2} = \sqrt{8}$

$x-7 = \pm 2\sqrt{2}$

$x = 7 \pm 2\sqrt{2}$

22. $2x^2 + 13x = 7$

$2x^2 + 13x - 7 = 0$

$(x+7)(2x-1)$

$x = -7, \frac{1}{2}$

Solve the following equations by Completing the Square.

23. $x^2 + 4x - 14 = 2$

$x^2 + 4x + 4 = 16 + 4$

$\sqrt{(x+2)^2} = \sqrt{20}$

$x+2 = \pm 2\sqrt{5}$

$x = -2 \pm 2\sqrt{5}$

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

$\frac{2xy}{2x} = \frac{3y}{2x}$
 $y = \frac{3}{2}$
 $y^2 = \frac{9}{4}$

24. $4x^2 + 12x + 3 = 0$

$4x^2 + 12x = -3$

$4(x^2 + 3x + \frac{9}{4}) = -3 + 4(\frac{9}{4})$

$\frac{4(x + \frac{3}{2})^2}{4} = \frac{6}{4}$

$\sqrt{(x + \frac{3}{2})^2} = \sqrt{\frac{3}{2}}$

$x + \frac{3}{2} = \pm \sqrt{\frac{3}{2}}$

$x = -\frac{3}{2} \pm \frac{\sqrt{6}}{2}$

$\frac{\sqrt{3}}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{\sqrt{6}}{2}$

25. Find the axis of symmetry, vertex, and y-intercept for the function, $f(x) = 3x^2 - 10x + 7$.

$$x = \frac{-(-10)}{2(3)} = \frac{10}{6} = \frac{5}{3}$$

Vertex $(\frac{5}{3}, -\frac{4}{3})$

Axis of Sym = $x = \frac{5}{3}$

y-intercept = $(0, 7)$

$$f(\frac{5}{3}) = 3(\frac{5}{3})^2 - 10(\frac{5}{3}) + 7 = -\frac{4}{3}$$

26. Write an expression for the described function: a cube root function with a vertical reflection, horizontal shrink of $1/3$, a vertical stretch of 2.5, a shift left 3 and down 4.

$$f(x) = -2.5 \sqrt[3]{3(x+3)} - 4$$

27. Convert the following to vertex form: $f(x) = 5x^2 + 30x - 14$, then state the vertex.

$$5x^2 + 30x = 14$$

$$5(x^2 + 6x + \frac{9}{5}) = 14 + 5(\frac{9}{5})$$

$$5(x+3)^2 = 59$$

$$5(x+3)^2 - 59 = f(x)$$

Vertex $(-3, -59)$

Perform each operation and write your answer in standard form. What is the standard form of a complex number? SHOW WORK! Also you CAN check your answers with a calculator!!!

28. $(3 - i) - (-2 - 7i)$

$$3 + 2 - i + 7i$$

$$5 + 6i$$

29. $(6 - 5i)(6 + 5i)$

	6	$-5i$	
6	36	$-30i$	= 36 + 25 =
$5i$	$30i$	$+25i^2$ 25	

$$= 61$$

30. $\frac{3-2i}{4+5i} \cdot \frac{4-5i}{4-5i} = \frac{2-23i}{16+25} =$

	3	$-2i$	
4	12	$-8i$	=
$-5i$	$-15i$	$10i^2$ -10	

$$\frac{2-23i}{41}$$

31. Find the modulus of $3 - 2i$

$$\sqrt{3^2 + (-2)^2}$$

$$9 + 4 = \sqrt{13}$$

32. A water balloon is launched from a slingshot. The behavior of this is modeled by the function $h(t) = -16t^2 + 64t + 15$, where h is the height (in feet) of the water balloon after t seconds. Find the maximum height of the water balloon and state at what time this occurs. Put the answer in contexts. If you do not show work, tell me how you solved it. Be specific!

Graph + find max or ...

$$h(t) = -16t^2 + 64t + 15$$

$$x = \frac{-b}{2a} = \frac{-64}{2(-16)} = 2$$

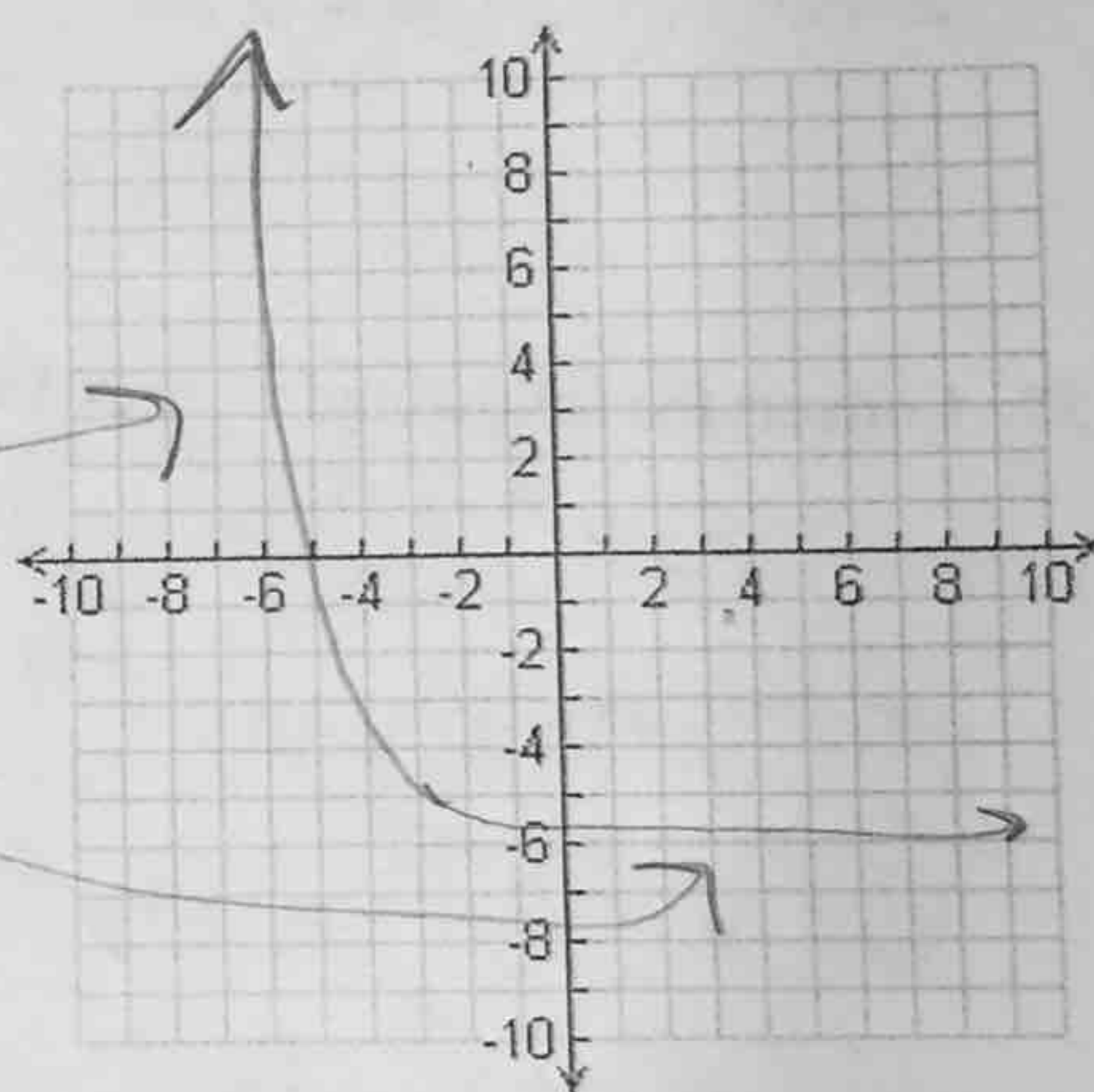
$$h(2) = -16(2)^2 + 64(2) + 15 = 79$$

Max is (2, 79)

at 2 min the H₂O balloon is 79 ft. up 😊

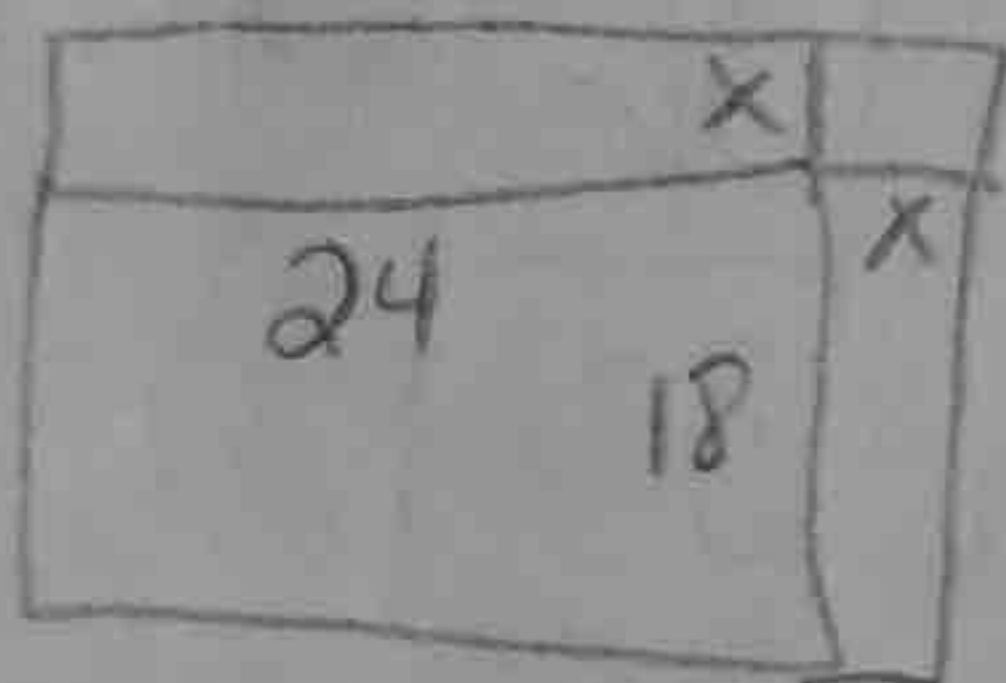
33. Draw an example of a graph that has the following end behavior.

As $x \rightarrow -\infty, y \rightarrow \infty$ and as $x \rightarrow \infty, y \rightarrow -6$



34. Peeps wants to put an equal patio on two adjacent sides of her rectangular pool. Her pool's dimensions are 18 by 24 feet. She is planning on building her patio by pouring an equal width of concrete along two adjacent sides (the length and the width). Peeps has 135 square feet of concrete to use.

A. Draw a picture of the pool and the patio. Use x to mark the extensions.



B. Create an equation that represents the situation.

$$(x+24)(x+18) = (18 \cdot 24) + 135$$

$$(x+24)(x+18) = 567$$

C. Solve the equation to find the length added to each side.

$$(x+24)(x+18) = 567$$

$$x = 3 \text{ ft.}$$

$$y_1 = (x+24)(x+18)$$

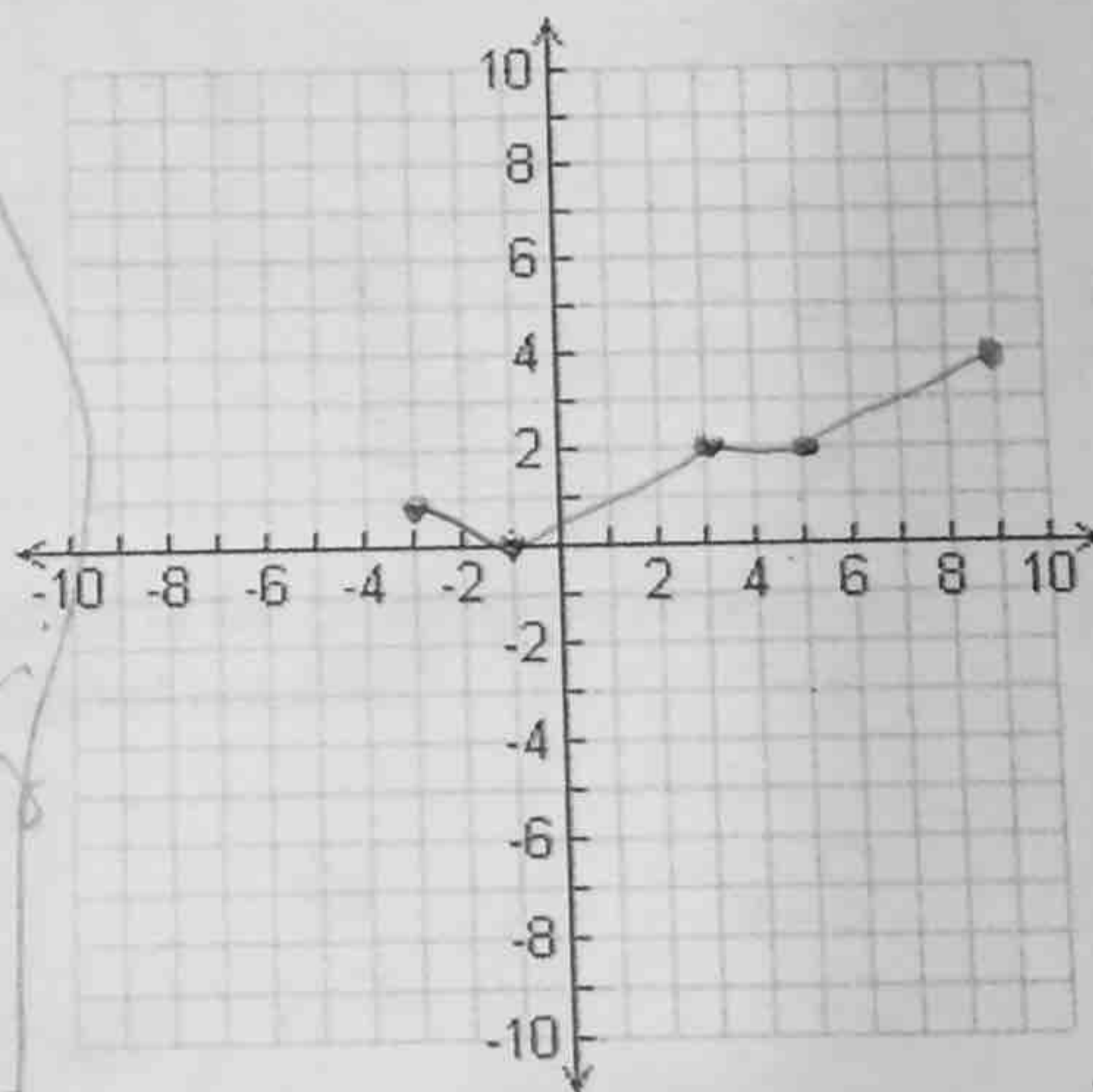
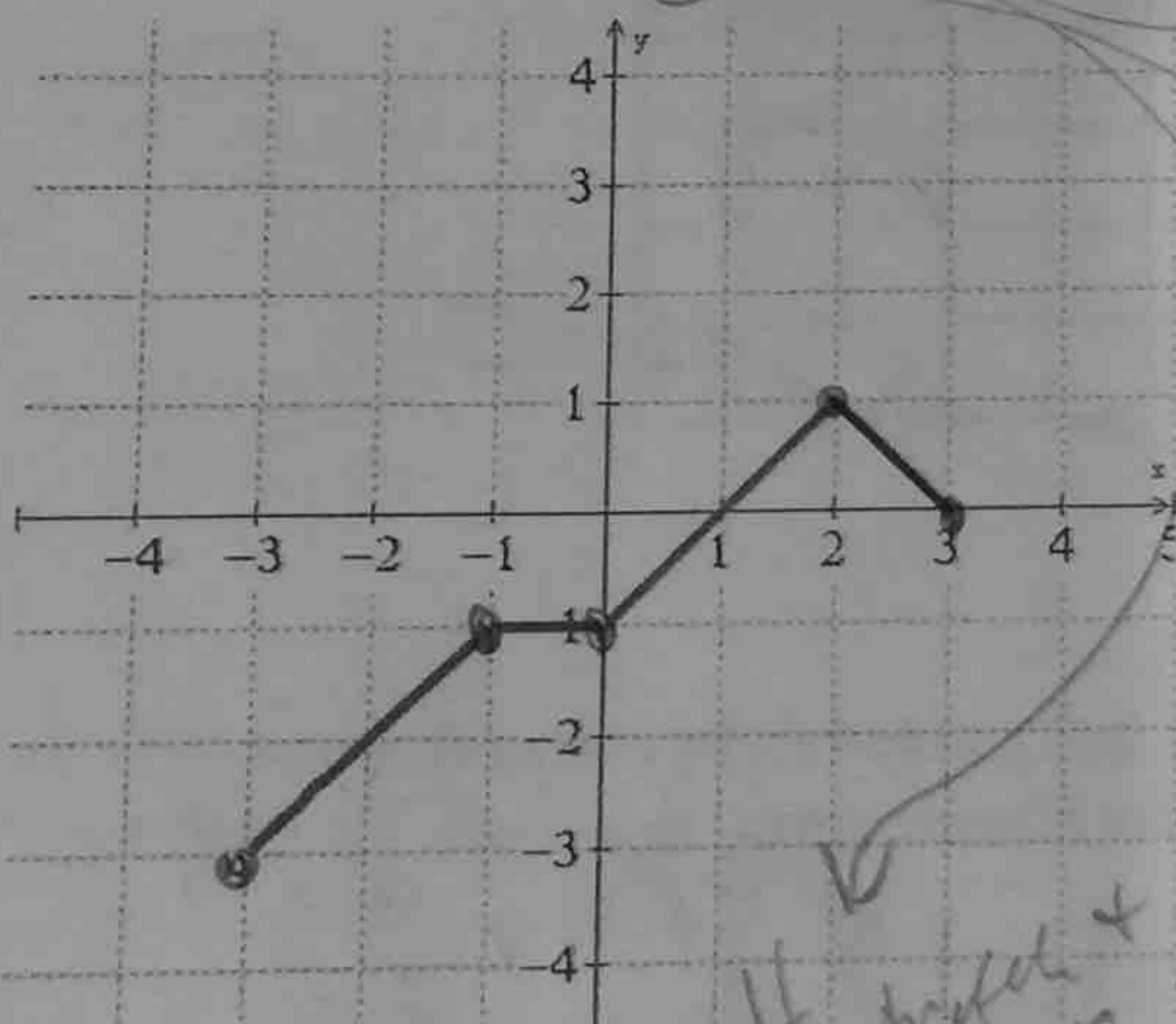
$$y_2 = 567$$

find intersection

D. Write the answer in terms of context with the problem.

She should add 3 ft to both sides ☺

34. The graph of $g(x)$ is given below. Graph the transformed function as described by the equation $g(x) = -g\left(-\frac{1}{2}(x-3)\right) + 1$. List all the transformations that are occurring to $g(x)$.



H stretch + reflect
SO multiply
by -2

V reflect

x+3

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

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

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

x+3	y+1
9	4
5	2
3	2
-1	0
-3	1

35. Write a quadratic expression given the following zeros: 3 and -2

$$(x-3)(x+2)$$

	x	-3
x	x^2	$-3x$
2	$2x$	-6

$$x^2 - x - 6 = f(x)$$

36. Write a quadratic expression given the following zeros: $-2 + 5i$ and -4 .

$$x = -2 + 5i$$

$$x = -2 - 5i$$

$$x = -4$$

$$x + 2 - 5i = 0$$

$$x + 2 + 5i = 0$$

$$x + 4 = 0$$

	x	2	$-5i$
x	x^2	$2x$	$-5ix$
2	$2x$	4	$-10i$
$5i$	$5ix$	$10i$	$-25i^2$ 25

$$x^2 + 4x + 29$$

	x^2	$4x$	29
x	x^3	$4x^2$	$29x$
4	$4x^2$	$16x$	116

$$x^3 + 8x^2 + 45x + 116$$