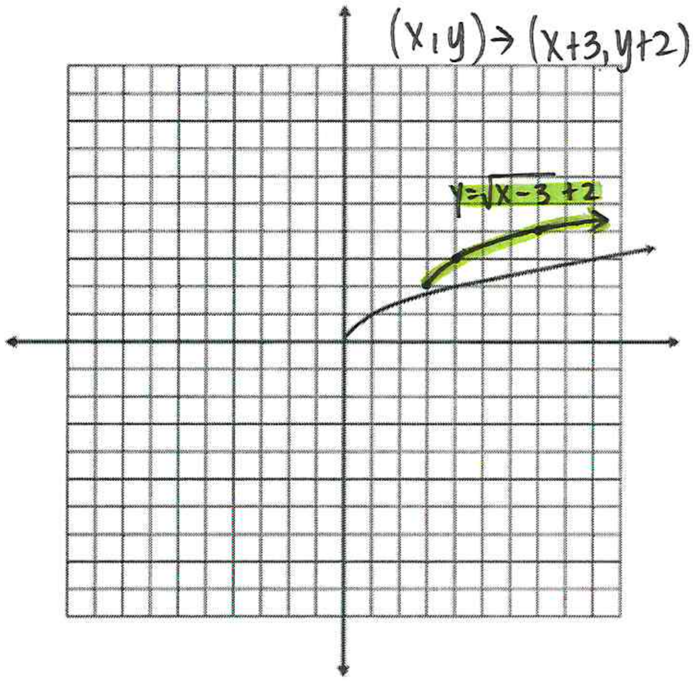
 Date: Answer key

OUTCOME R13 – Review

1. **Graph** each function. The graph of $y = \sqrt{x}$ is provided as a reference.

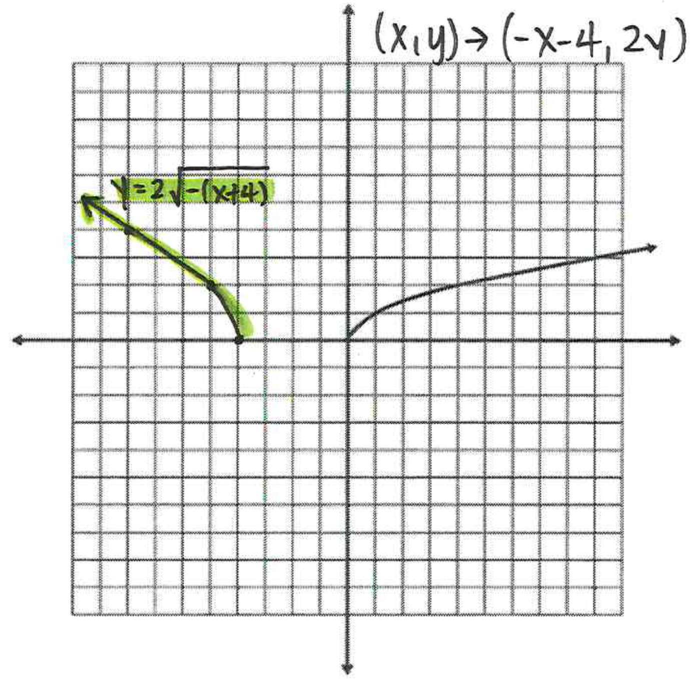
a) $y = \sqrt{x-3} + 2$

$(x, y) \rightarrow (x+3, y+2)$



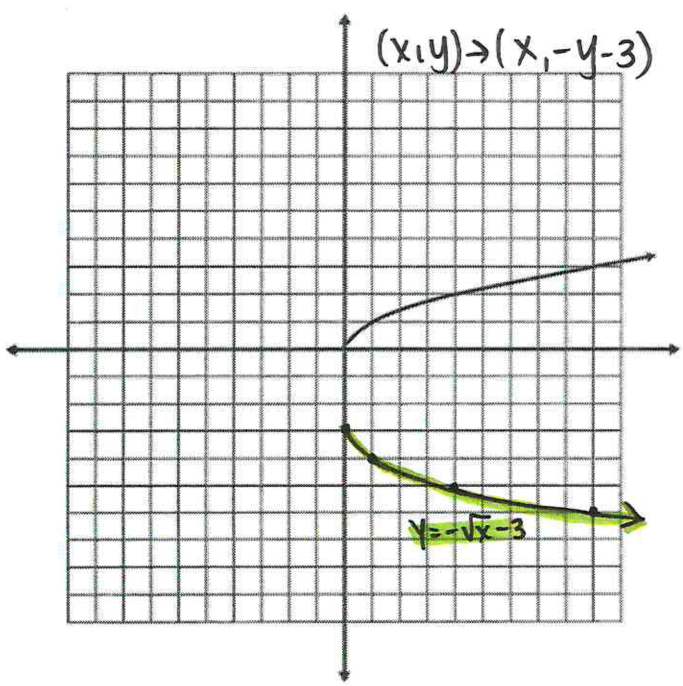
b) $y = 2\sqrt{-(x+4)}$

$(x, y) \rightarrow (-x-4, 2y)$



c) $y = -\sqrt{x} - 3$

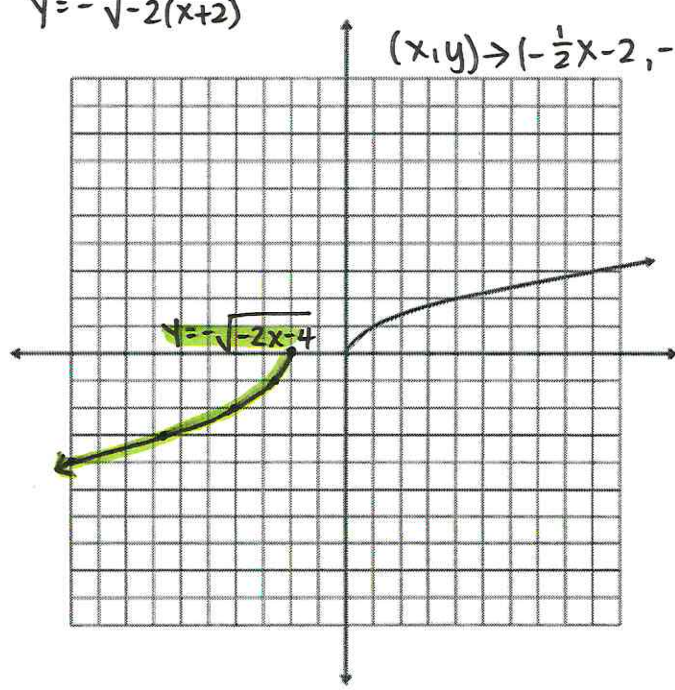
$(x, y) \rightarrow (x, -y-3)$



d) $y = -\sqrt{-2x-4}$

$y = -\sqrt{-2(x+2)}$

$(x, y) \rightarrow (-\frac{1}{2}x-2, -y)$



2. Match each function with its graph.

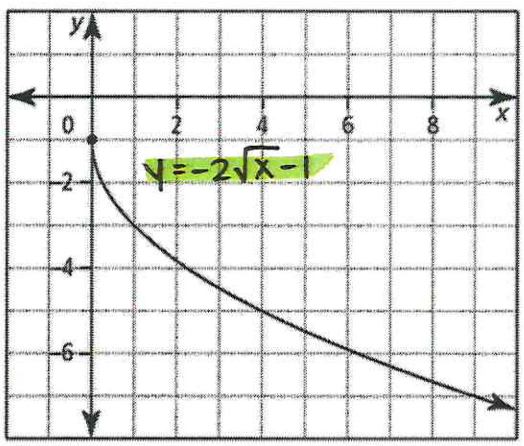
a) $y = 2\sqrt{x} - 1$ D

b) $y = -2\sqrt{x} - 1$ A

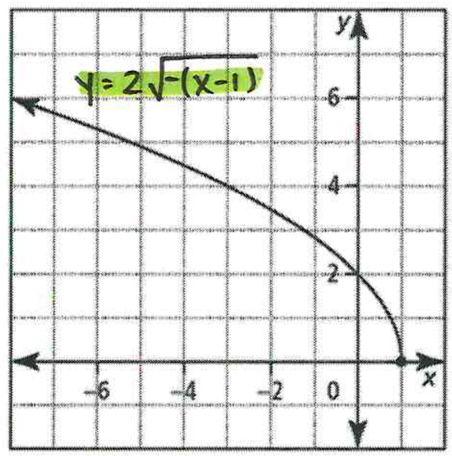
c) $y = 2\sqrt{x-1}$ C

d) $y = 2\sqrt{-(x-1)}$ B

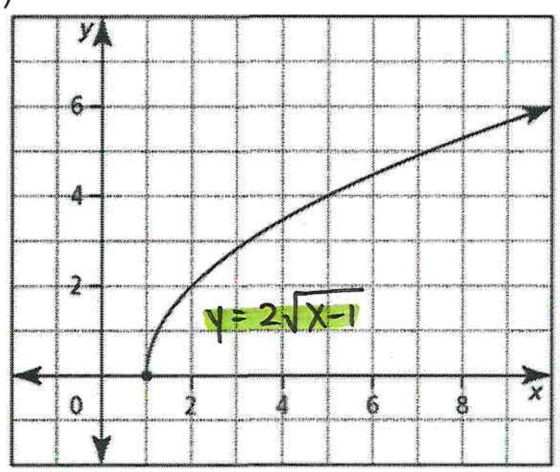
A)



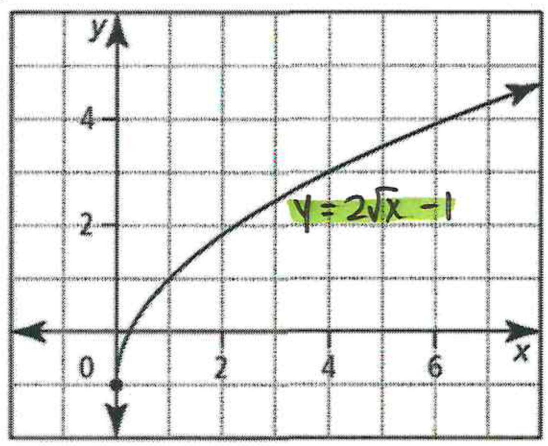
B)



C)



D)



3. State the **domain** and **range** of each function.

a) $y = \sqrt{-x} - 4$

Domain: $x \le 0$

Range: $y \ge -4$

b) $y = 4\sqrt{x-4}$

Domain: $x \ge 4$

Range: $y \ge 0$

c) $y = -\sqrt{x-4} + 4$

Domain: $x \ge 4$

Range: $y \le 4$

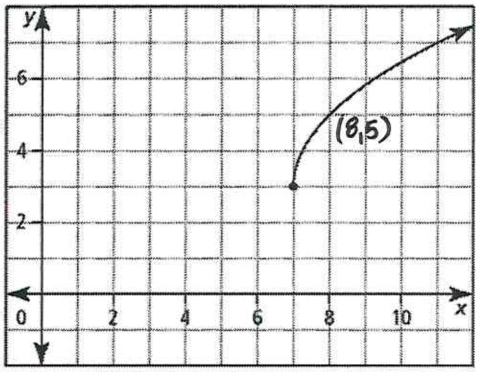
d) $y = -\sqrt{4x}$

Domain: $x \ge 0$

Range: $y \le 0$

4. For each function, write an **equation** of a radical function of the form $y = a\sqrt{b(x-h)} + k$

a) $h=7 \quad k=3$



$y = \sqrt{b(x-h)} + k$

$5 = \sqrt{b(8-7)} + 3$

$2 = \sqrt{b(1)}$

$(2)^2 = \left(\sqrt{b(1)}\right)^2$

$4 = b(1)$

$4 = b$

$y = \sqrt{4(x-7)} + 3$

or

$y = 2\sqrt{x-7} + 3$

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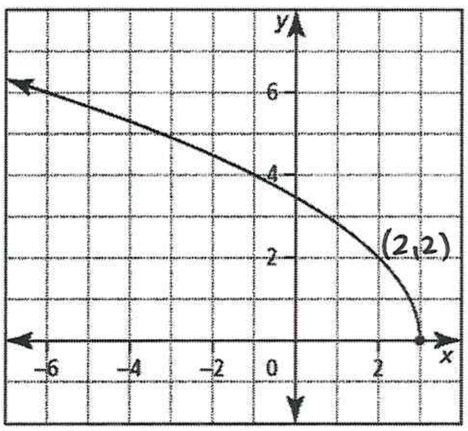
b) $h=3 \quad k=0$



$y = \sqrt{b(x-h)} + k$

$2 = \sqrt{b(2-3)}$

$2 = \sqrt{b(-1)}$

$(2)^2 = \left(\sqrt{b(-1)}\right)^2$

$4 = b(-1)$

$-4 = b$

$y = \sqrt{-4(x-3)}$

or

$y = 2\sqrt{-(x-3)}$

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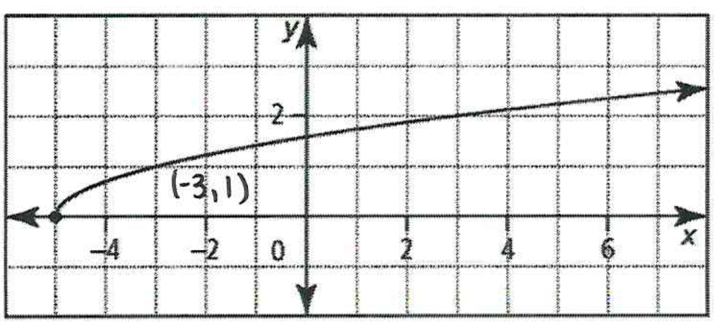
c) $h=-5 \quad k=0$



$y = \sqrt{b(x-h)} + k$

$1 = \sqrt{b(-3+5)}$

$1 = \sqrt{b(2)}$

$(1)^2 = \left(\sqrt{b(2)}\right)^2$

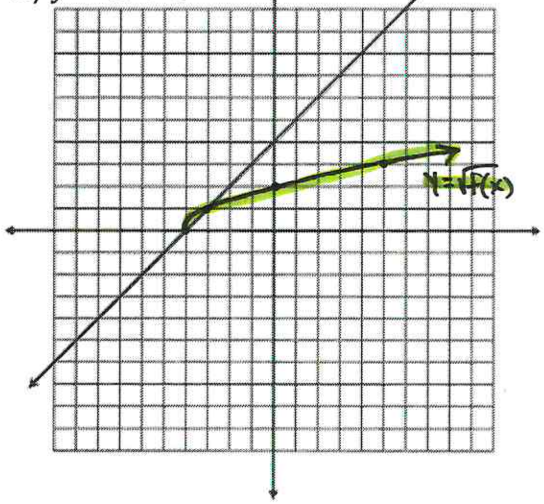
$1 = b(2)$

$\frac{1}{2} = b$

$y = \sqrt{\frac{1}{2}(x+5)}$

5. Given the graph of $y = f(x)$, **graph** $y = \sqrt{f(x)}$ on the same grid. State the **domain** and **range** for both $y = f(x)$ and $y = \sqrt{f(x)}$

a) $y = x + 4$



$y = f(x)$ Domain: $x \in \mathbb{R}$

Range: $y \in \mathbb{R}$

$y = \sqrt{f(x)}$ Domain: $x \geq -4$

Range: $y \geq 0$

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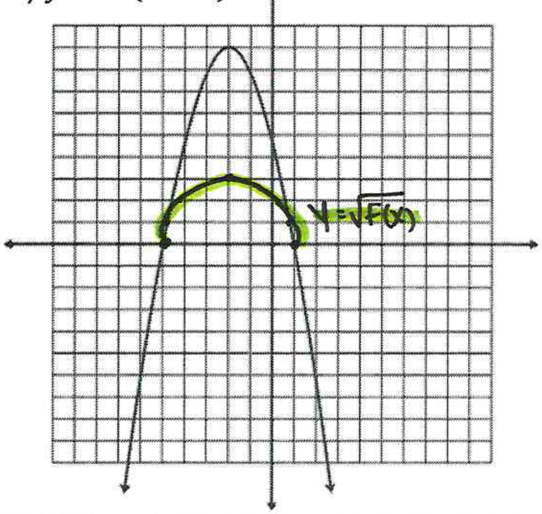
b) $y = -(x + 2)^2 + 9$



$y = f(x)$ Domain: $x \in \mathbb{R}$

Range: $y \leq 9$

$y = \sqrt{f(x)}$ Domain: $-5 \leq x \leq 1$

Range: $0 \leq y \leq 3$

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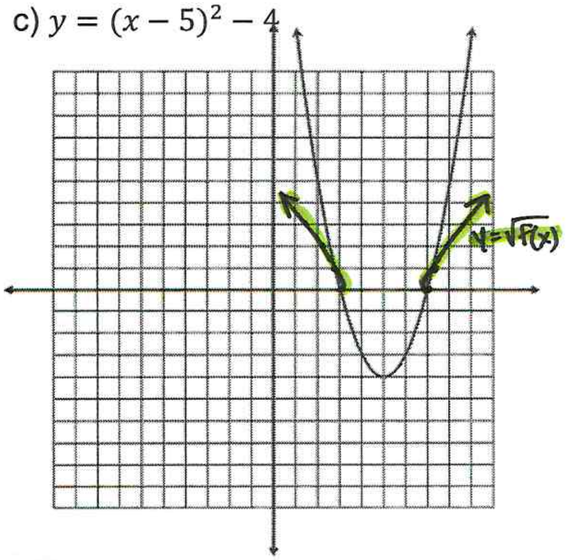
c) $y = (x - 5)^2 - 4$



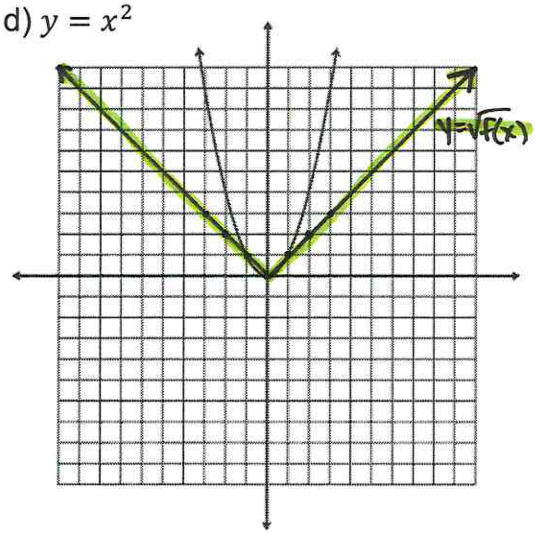
$y = f(x)$ Domain: $x \in \mathbb{R}$

Range: $y \geq -4$

$y = \sqrt{f(x)}$ Domain: $(-\infty, 3] \cup [7, \infty)$

Range: $y \geq 0$

d) $y = x^2$



$y = f(x)$ Domain: $x \in \mathbb{R}$

Range: $y \geq 0$

$y = \sqrt{f(x)}$ Domain: $x \in \mathbb{R}$

Range: $y \geq 0$

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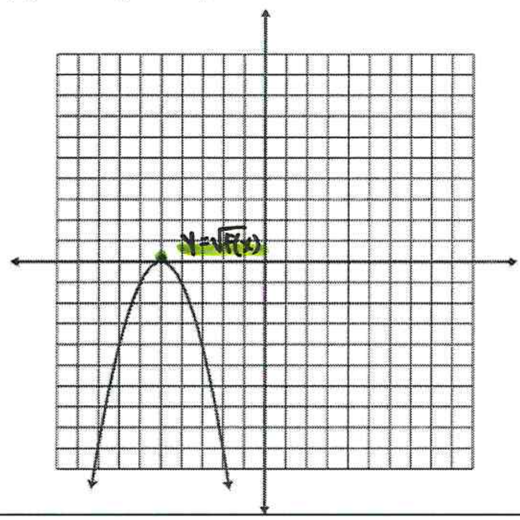
e) $y = -(x+5)^2$



$y = f(x)$ Domain: $x \in \mathbb{R}$

Range: $y \leq 0$

$y = \sqrt{f(x)}$ Domain: $x = 5$

Range: $y = 0$

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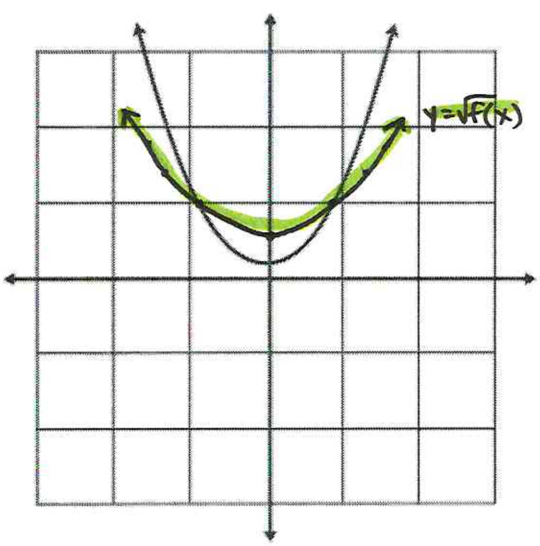
f) $y = x^2 + \frac{1}{4}$



$y = f(x)$ Domain: $x \in \mathbb{R}$

Range: $y \geq \frac{1}{4}$

$y = \sqrt{f(x)}$ Domain: $x \in \mathbb{R}$

Range: $y \geq \frac{1}{2}$

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6. Identify the **domain** and **range** of $y = \sqrt{f(x)}$

a) $f(x) = x^2 - 16$

Domain $(-\infty, -4] \cup [4, \infty)$

Range: $[0, \infty)$

b) $f(x) = x^2 + 5$

Domain $(-\infty, \infty)$

Range: $[\sqrt{5}, \infty)$

c) $f(x) = 2x^2 + 9$

Domain $(-\infty, \infty)$

Range: $[3, \infty)$

7. For each point given on the graph of $y = f(x)$, does the corresponding **point** on the graph of $y = \sqrt{f(x)}$ exist? If so, state the coordinates of the point.

a) $(9, 14)$

$(9, \sqrt{14})$

b) (p, r)

$(p, \sqrt{r})$

c) $(-2, 9)$

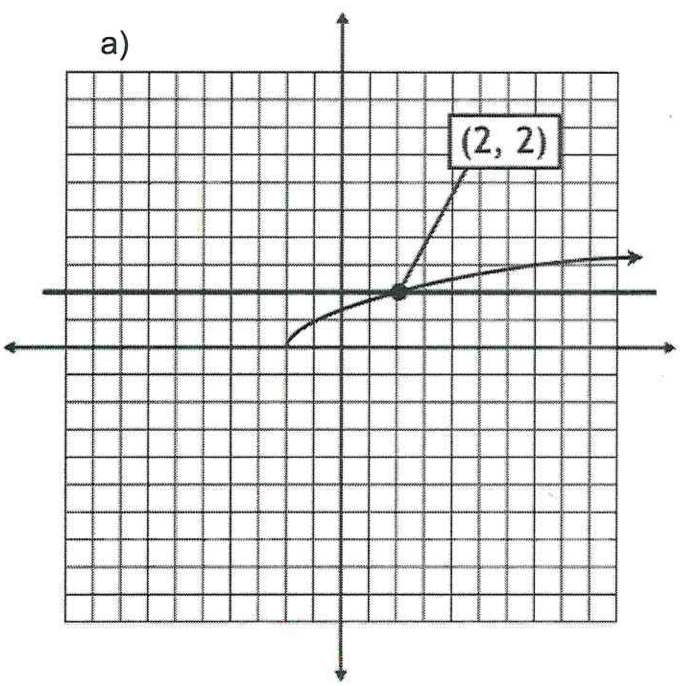
$(-2, 3)$

d) $(-32, -1)$

does not exist

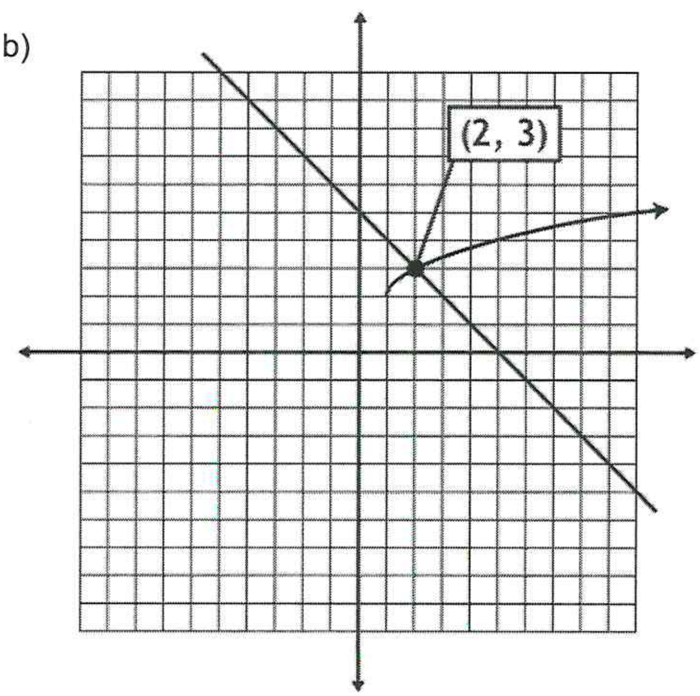
8. Write the **equation** that can be used to find the point of intersection for each pair of graphs.

a)



$\sqrt{x+2} = 2$

b)



$\sqrt{x-1} + 2 = -x + 5$

9. **Solve** each equation **algebraically**.

a) $-3\sqrt{x+2}+4=1$ $\qquad x \geq -2$

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

$$\sqrt{x+2} = 1$$

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

$$x+2 = 1$$

$$x = -1$$

Check $x=-1$

LHS	RHS
$-3\sqrt{-1+2}+4$	1
$-3\sqrt{1}+4$	
$-3+4$	
1 ✓	✓

LHS = RHS

The solution is $x=-1$

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b) $\sqrt{\frac{1}{2}(3x-2)}=1$ $\qquad x \geq 2/3$

$$\left(\sqrt{\tfrac{1}{2}(3x-2)}\right)^2 = (1)^2$$

$$\tfrac{1}{2}(3x-2) = 1$$

$$3x-2 = 2$$

$$\frac{3x}{3} = \frac{4}{3}$$

$$x = \frac{4}{3}$$

Check $x = 4/3$

LHS	RHS
$\sqrt{\frac{1}{2}(3(\frac{4}{3})-2)}$	1
$\sqrt{\frac{1}{2}(4-2)}$	
$\sqrt{\frac{1}{2}(2)}$	
$\sqrt{1}$	
1 ✓	✓

LHS = RHS

The solution is $x = 4/3$

10. **Solve** each equation **algebraically**.

a) $\sqrt{x+4}+8=x$ $\quad x \geq -4$

$\sqrt{x+4}=x-8$

$(\sqrt{x+4})^2=(x-8)^2$

$x+4=x^2-16x+64$

$0=x^2-17x+60$

$0=(x-12)(x-5)$

$x=12, \quad x \cancel{=5}$ extraneous

Check $x=12$

LHS	RHS
$\sqrt{12+4}+8$	12
$\sqrt{16}+8$	
$4+8$	
12 ✓	✓
LHS = RHS	

check $x=5$

LHS	RHS
$\sqrt{5+4}+8$	5
$\sqrt{9}+8$	
$3+8$	
11 x	x
LHS ≠ RHS	

The solution is $x=12$

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b) $x=\sqrt{x+10}+2$ $\quad x \geq -10$

$x-2=\sqrt{x+10}$

$(x-2)^2=(\sqrt{x+10})^2$

$x^2-4x+4=x+10$

$x^2-5x-6=0$

$(x-6)(x+1)=0$

$x=6, \quad x \cancel{=-1}$ extraneous

check $x=6$

LHS	RHS
6	$\sqrt{6+10}+2$
	$\sqrt{16}+2$
	$4+2$
✓	✓ 6
	LHS = RHS

Check $x=-1$

LHS	RHS
-1	$\sqrt{-1+10}+2$
	$\sqrt{9}+2$
	$3+2$
x	5 x

LHS ≠ RHS

The solution is $x=6$

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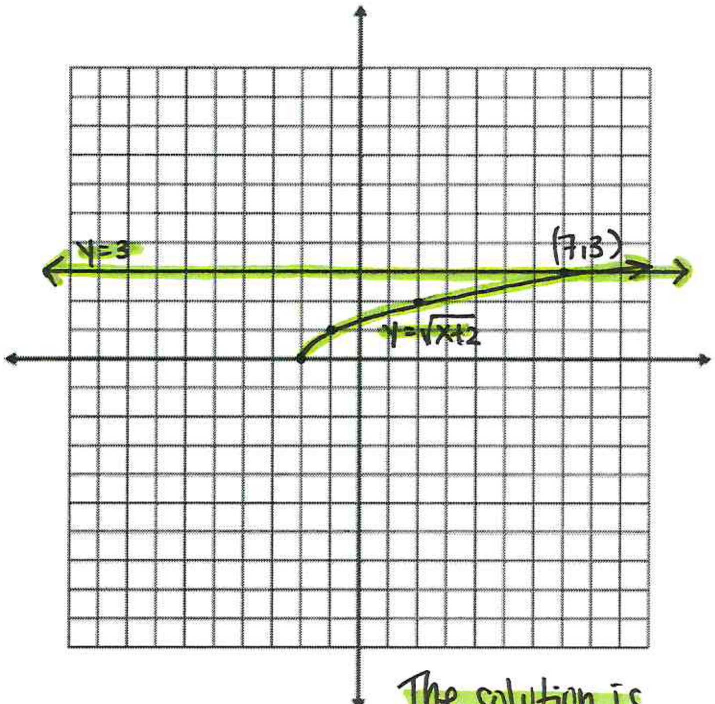
11. Given the radical equation $\sqrt{x+2} = 3$

a) **Solve** by finding the point of intersection.



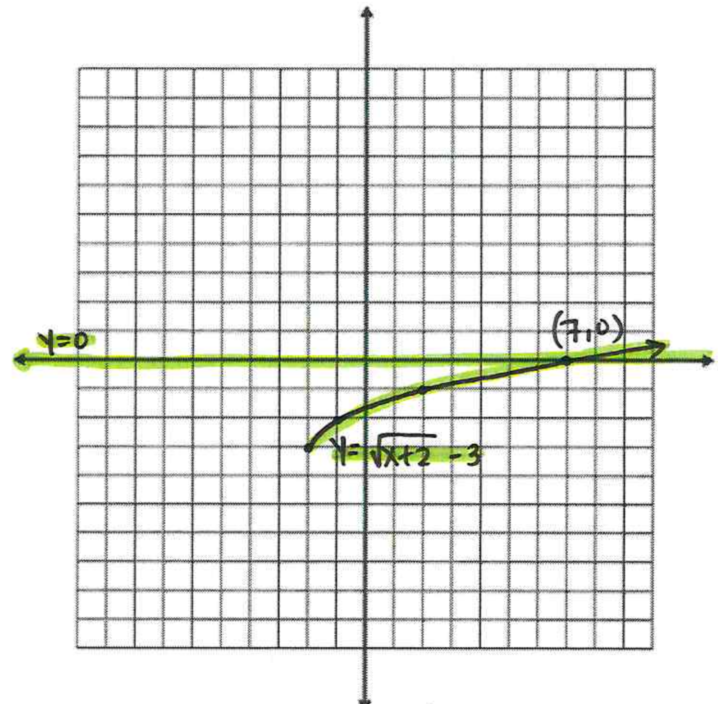
The solution is

$x = 7$

b) **Solve** by finding the x – intercept of a single function.

$\sqrt{x+2} = 3$

$\sqrt{x+2} - 3 = 0$



The solution is

$x = 7$

12. **Solve** the following radical equation $2\sqrt{x+3} = x + 3$ **graphically**.

The solutions are

$x = -3$ and $x = 1$