Name: Lesson 9 solutions, part 2 Class #:______

## 6. SOLVE RADICAL EQUATIONS

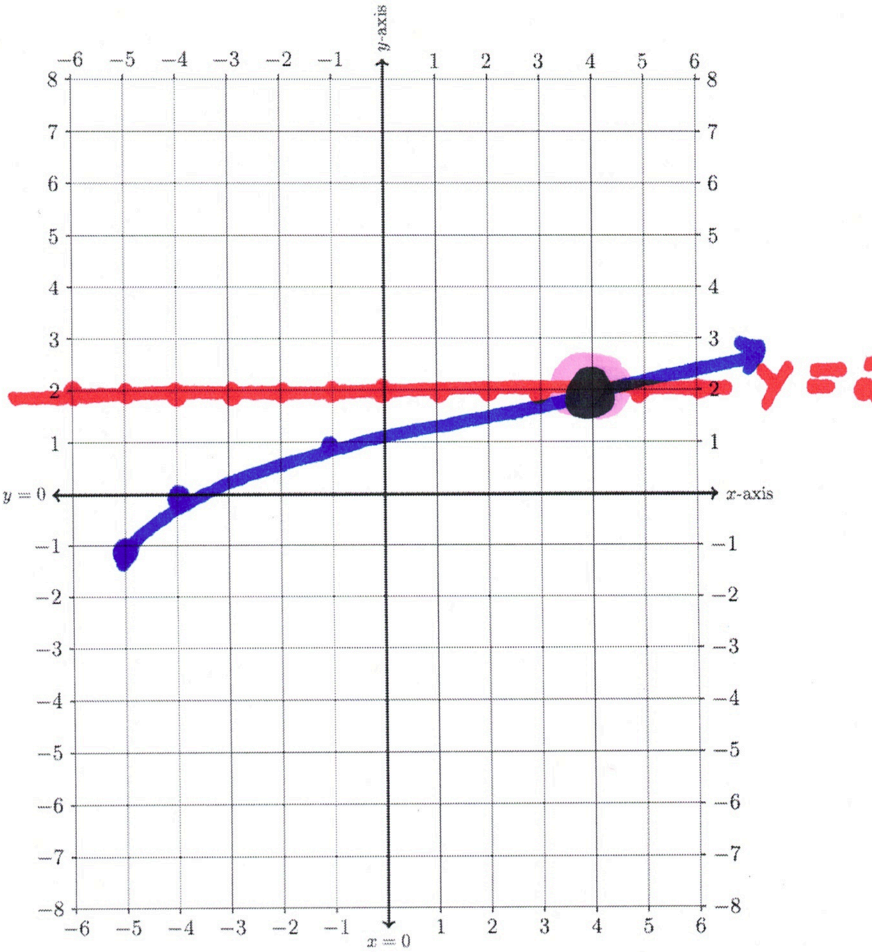
6A. Solve the following radical equation using a graphical method

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

Find input value x such that output on LHS is equal to output on RHS

Use the table and axes below to do this work.

| $x$ | LHS $\sqrt{x+5} - 1$ | RHS $y = 2$ |
|---|---|---|
| $-6$ | Error | 2 |
| $-5$ | $-1$ | 2 |
| $-4$ | 0 | 2 |
| $-3$ | $\sqrt{2} - 1$ | 2 |
| $-2$ | $\sqrt{3} - 1$ | 2 |
| $-1$ | 1 | 2 |
| 0 | $\sqrt{5} - 1$ | 2 |
| 1 | 1.4495... | 2 |
| 2 | 1.6458... | 2 |
| 3 | $\sqrt{8} - 1$ | 2 |
| 4 | 2 | 2 |
| 5 | $\sqrt{10} - 1$ | 2 |
| 6 | 2.3166 ... | 2 |




Point of intersection

(4, 2)

$\Rightarrow \boxed{x = 4}$ ✓

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6B. Solve the following radical equation using a graphical method

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

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

$$+1 \qquad +1$$

$$0$$

$$\Rightarrow \sqrt[2]{x+5} = 3$$

$$\Rightarrow \left(\sqrt[2]{x+5}\right)^2 = (3)^2$$

$$\Rightarrow x \cancel{+5} = 9$$

$$-5 \qquad -5$$

$$0$$

Check: $x = 4$

LHS $\sqrt{x+5} - 1 = \sqrt{4+5} - 1$

$= \sqrt{9} - 1$

$= 3 - 1$

$= 2 = 2$ ✓
RHS

$$\Rightarrow \boxed{x = 4}$$

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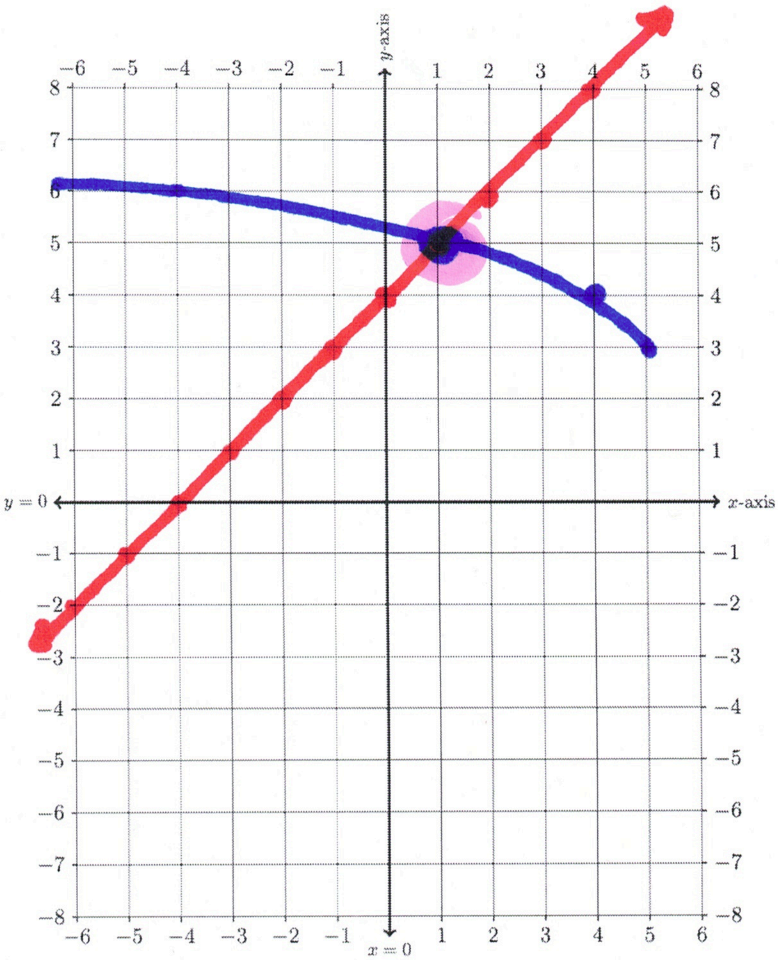
## 7. OPTIONAL CHALLENGE PROBLEM: SOLVE RADICAL EQUATIONS

7A. Solve the following radical equation using a graphical method

$$3 + \sqrt[2]{5 - x} = x + 4$$

Use the table and axes below to do this work.

| $x$ | LHS $3+\sqrt{5-x}$ | RHS $x+4$ |
|---|---|---|
| $-6$ | 6.3166.. | -2 |
| $-5$ | $3+\sqrt{9}$ | -1 |
| $-4$ | 6 | 0 |
| $-3$ | $3+\sqrt{8}$ | 1 |
| $-2$ | 5.8284... | 2 |
| $-1$ | $3+\sqrt{6}$ | 3 |
| $0$ | $3+\sqrt{5}$ | 4 |
| $1$ | 5 | 5 |
| $2$ | 4.7321... | 6 |
| $3$ | 4.4142... | 7 |
| $4$ | 4 | 8 |
| $5$ | 3 | 9 |
| $6$ | Error | 10 |




Point of intersection

(1, 5)

$\Rightarrow \boxed{x = 1}$ ✓

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7B. Solve the following radical equation using a graphical method

$$3 + \sqrt[2]{5 - x} = x + 4$$

$$\cancel{3} + \sqrt[2]{5-x} = x + 4$$

$$-3 \qquad\qquad\qquad\qquad -3$$

$$0$$

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

$$\Rightarrow \left(\sqrt[\cancel{2}]{5-x}\right)^{\cancel{2}} = (x+1)^2$$

O

F

$$\Rightarrow 5 - x = (x+1)\cdot(x+1)$$

I

L

$$\Rightarrow 5 - x = x\cdot(x+1) + 1\cdot(x+1)$$

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$$\Rightarrow \quad 5 - x = x^2 + x + x + 1$$

$$\Rightarrow \quad \cancel{5} - \cancel{x} = x^2 + 2x + 1$$

$$\quad -5 + x \qquad\qquad\qquad +x \quad -5$$

$$\quad 0 \qquad\quad 0$$

$$\Rightarrow \quad 0 = x^2 + 3x - 4$$

$$0 = ax^2 + bx + c$$

standard form of quadratic equation

$a = 1 \qquad b = 3 \qquad c = -4$

Mult

$a \cdot c$

$b$

Add

Factor using the AC method

mult

$-4$

$+4 \qquad -1$

$3$

add

$+3x = +4x - x$

$+4 \cdot -1 = -4$ ✓ $\qquad +4 + -1 = 3$

$$\Rightarrow \quad 0 = x^2 + 3x - 4$$

$$\Rightarrow \quad 0 = \underbrace{x^2 + 4x} \underbrace{- x - 4}$$

factor by grouping

$$\Rightarrow \quad 0 = x\boxed{(x+4)} - 1 \cdot \boxed{(x+4)}$$

$$\Rightarrow \quad 0 = \underbrace{\boxed{(x-1)}}_{a} \cdot \underbrace{\boxed{(x+4)}}_{b}$$

$$a \cdot b = 0$$

$$\Rightarrow a = 0 \text{ or } b = 0$$

$$\Rightarrow \quad \begin{array}{rr} x - 1 & = 0 \\ +1 & +1 \end{array} \qquad \text{or} \qquad \begin{array}{rr} x + 4 & = 0 \\ -4 & -4 \end{array}$$

$$\Rightarrow \quad \boxed{x = 1} \; ✓ \qquad \text{or} \qquad x \neq -4$$

extraneous

Check $x = 1$:

LHS : $3 + \sqrt[2]{5-x} = 3 + \sqrt{5-1}$

$= 3 + \sqrt{4}$

$= 3 + 2 = 5$ ✓

RHS $x + 4 = 1 + 4 = 5$ ✓

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Check $x \cancel{=} -4$ Not a solution

LHS : $3 + \sqrt[2]{5-x} = 3 + \sqrt{5-(-4)}$

$= 3 + \sqrt{5+4}$

$= 3 + \sqrt{9}$

$= 3 + 3$

$\neq \boxed{6}$

RHS : $x + 4 = -4 + 4 \neq \boxed{0}$ ✗