

2.3 Solving Radical Equations Graphically

Ex: what are the roots of

$$\sqrt{x+5} - 3 = 0 \quad \{x \mid x \geq -5, x \in \mathbb{R}\}$$

Algebraically:

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

$$x+5 = 9$$

$$x = 4$$

check

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

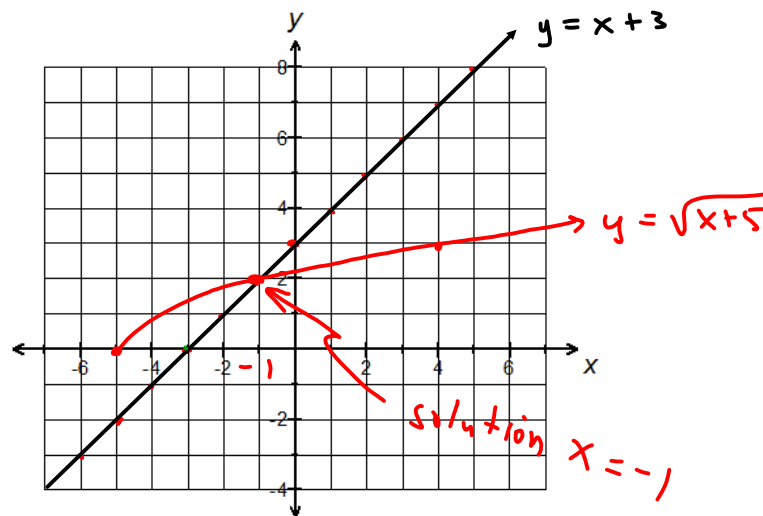
$$\sqrt{9} \quad 3$$

$$3 = 3 \checkmark$$

Graphically: locate x-intercept

Ex: Solve $\sqrt{x+5} = x+3$

Graphically: graph $y = \sqrt{x+5}$ and $y = x+3$ and determine the point(s) of intersection (x-coordinate)



Algebraically: $[\sqrt{x+5}]^2 = [x+3]^2$

check $x = -1$
 $\sqrt{-1+5} = -1+3$
 $\sqrt{4} = 2$
 $2 = 2 \checkmark$

check $x = -4$
 $\sqrt{-4+5} = -4+3$
 $\sqrt{1} \neq -1$
 $1 \neq -1$

$$x+5 = x^2 + 6x + 9$$

$$x^2 + 5x + 4 = 0$$

$$(x+1)(x+4) = 0$$

$$x+1=0 \quad x+4=0$$

$x = -1$
 good

~~$x = -4$~~
Extraneous

$$x \geq 0$$

$$x - \sqrt{3x} = 6$$

$$x - 6 = \sqrt{3x} \Rightarrow (x - 6)^2 = (\sqrt{3x})^2$$

$$y = x - 6$$

$$y = \sqrt{3x}$$

$$x^2 - 12x + 36 = 3x$$

$$x^2 - 15x + 36 = 0$$

$$(x - 12)(x - 3) = 0$$

check: $x - \sqrt{3x} = 6$ } $x = 12$ $x = 3$

$x = 12$ $12 - \sqrt{3(12)}$

$12 - \sqrt{36}$

$12 - 6 = 6$

~~$x = 3$~~

NO GOOD!

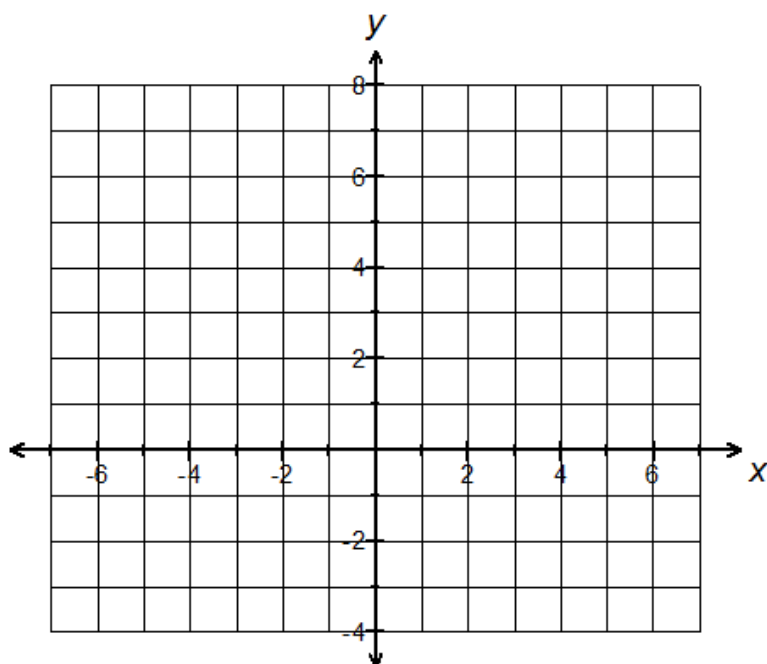
$3 - \sqrt{3(3)}$

$3 - \sqrt{9}$

$3 - 3$

$0 \neq 6$

Solve graphically: $\sqrt{25 - x^2} = 4$



Graph:

$$y = \sqrt{25 - x^2}$$

Graph:

$$y = 4$$