2.3 Solving Radical Equations Graphically

In your last math course you solved radical equations algebraically.

Steps for solving radical equations algebraically:

1. List any restrictions on the variable. Remember that you can't take the square root of a negative so, radicand > 0.

$7 = \sqrt{12 - x} + 4$

$12 - x \geq 0$

$12 \geq x$

$x \leq 12$

2. Isolate the radical.

$3 = \sqrt{12 - x}$

3. Square both sides to eliminate the radical.

$(3)^2 = \left(\sqrt{12 - x}\right)^2$

$9 = 12 - x$

4. Solve. Find the roots of the equation.

$-3 = -x$

$x = 3$

5. Check (verify) your solution to make sure the roots are not extraneous.
(always try to check in original)

$7 = \sqrt{12 - x} + 4$

$7 \quad \sqrt{12 - (3)} + 4$

$\sqrt{9} + 4$

$3 + 4$

$7 = 7$

$LS = RS$

Relate the roots and x-intercepts of a radical equation:

Example 1:

a. Determine the root(s) of $\sqrt{x+5}-3=0$ algebraically.

b. Graph the radical equation and determine the x-intercepts of the graph of $\sqrt{x+5}-3=0$

c. Describe the connection between the root(s) of the equation and the x-intercept(s) of the function.

Your Turn:

a. Graph the radical equation and determine the x-intercepts of the graph of $y = \sqrt{x+2} - 4$

b. Determine the root(s) of $y = \sqrt{x+2} - 4$ algebraically.

c. Describe the relationship between your findings in parts a. and b.

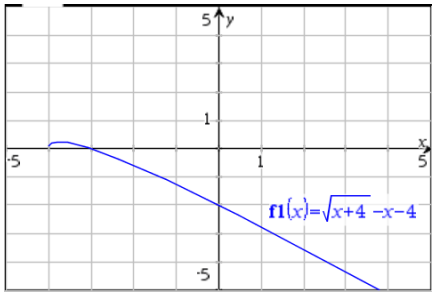
Strategies for Solving Graphically

Example 2: Graph the following equation and find the zero(s) of the function.

$$2+\sqrt{x+4}=x+6$$

Method 1: Graph a Single Equation

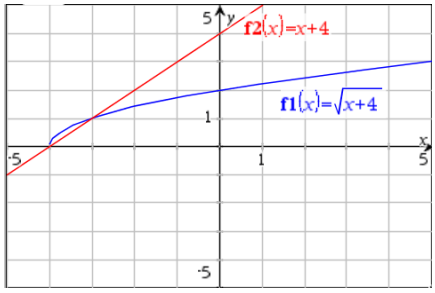
$$2+\sqrt{x+4}=x+6$$
$$\sqrt{x+4}-x-4=0$$
$$y=\sqrt{x+4}-x-4$$



Method 2: Graph Two Equations

$$2+\sqrt{x+4}=x+6$$
$$\sqrt{x+4}=x+4$$
$$y_1=\sqrt{x+4}$$
$$y_2=x+4$$

'intersect'



How many roots does there appear to be? How many are there? Why?

Find the root(s) by solving and checking algebraically.

Always remember to consider any restrictions on the variable!

Your Turn: Graph the following equation and find the zero(s) of the function.

$\sqrt{x+5} = x+3$ State any restrictions on the variable.

Method 1: Graph a Single Equation

Method 2: Graph Two Equations

What are the root(s) of the equation?

Find the root(s) by solving and checking algebraically.

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Example 3: Approximate Solutions to Radical Equations

a. Solve the radical equation $4+\sqrt{x+4}=x-4$ graphically, using either method.
State any restrictions on the variable.

b. Verify your solution algebraically.

$$4+\sqrt{x+4}=x-4$$
$$\sqrt{x+4}=x-8$$
$$\left(\sqrt{x+4}\right)^2=(x-8)^2$$
$$x+4=x^2-16x+64$$
$$x^2-17x+60=0$$
$$(x-12)(x-5)=0$$
$$x=12 \quad or \quad x=5$$

extraneous

Try Text Page 98 Question 14;

What real number is exactly one greater than its square root? Algebraically state your answer as an exact value and then verify graphically.

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Try Text Page 98 Question 15;

Homework

1. Assignment Handout BLM 2-5, "Solving Graphically"

2. Text Pages 96 - 98, Exercises # 1 - 6, 8 - 11, 13, C1, C3

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Attachments

Translations Assignment 1.doc

Transforming Radicals.pdf