1.1 Modeling & Equation Solving

Review Target: Find extrema, zeroes, in odd or even functions

Review of Prior Concepts

Solve the equation $x + 1 = 2\sqrt{x + 4}$ algebraically.

Show your work. **Explain your steps.**

$(x+1)^2 = (2\sqrt{x+4})^2$

$x^2+2x+1 = 4(x+4)$

$x^2+2x+1 = 4x+16$

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

$(x-5)(x+3) = 0$

$x-5=0$ $\quad x+3=0$

$\boxed{x=5}$ $\quad x=-3$ extraneous solution

check:

$-3+1 = 2\sqrt{-3+4}$

$-2 = 2\sqrt{1}$

$-2 \neq 2$

* square both sides
* get one side = to zero
* factor
* set each factor = to zero and solve
* check for extraneous solutions

More Practice

Solving Radical Equations

http://www.regentsprep.org/regents/math/algtrig/ate10/radlesson.htm

http://www.purplemath.com/modules/solverad2.htm

https://www.youtube.com/watch?v=JBCsfUaXTNs

SAT Connection

Passport to Advanced Math

7. Solve an equation in one variable that contains radicals.

Example: If $a = 5\sqrt{2}$ and $2a = \sqrt{2x}$, what is the value of x ?

$2(5\sqrt{2}) = \sqrt{2x}$

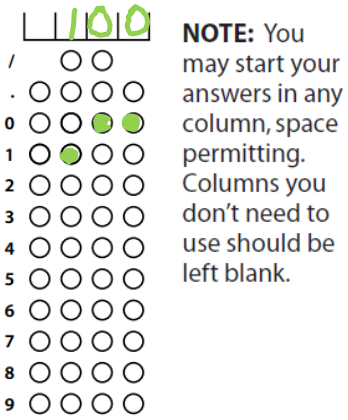
$10\sqrt{2} = \sqrt{2x}$

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

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

$100(2) = 2x$

$\frac{200}{2} = \frac{2x}{2}$ → $\boxed{x=100}$



NOTE: You may start your answers in any column, space permitting. Columns you don't need to use should be left blank.

Solution

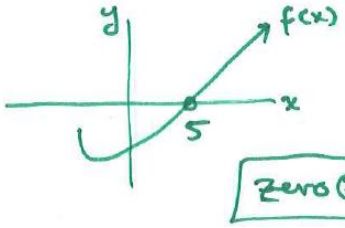
Fundamental Connection (p.70)

If a is a real number that solves the equation $f(x) = 0$, then these 3 statements are equivalent.

1. The number a is a ROOT (or SOLUTION) of the equation $f(x)=0$
2. The number a is a ZERO of $y = f(x)$
3. The number a is an X-INTERCEPT of the graph of $y=f(x)$

* ROOT, SOLUTION, ZERO, & X-INTERCEPT are all the same.

Example 1: Find the zero(s) of $f(x) = x + 1 - 2\sqrt{x+4}$ graphically.

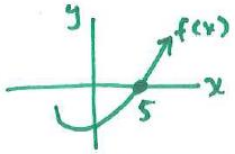


Zero @ $x = 5$

* graph the function
* MENU, Analyze Graph, Zero

Example 2: Solve the equation $x + 1 = 2\sqrt{x+4}$ by finding the x-intercepts graphically.

$x+1-2\sqrt{x+4}=0$



x-int @ $x = 5$

* get one side = to zero
* graph the function
* MENU, Analyze Graph, Zero

Now you try…& verify with your group members. (round to nearest thousandths – 3 decimal places)

Find the roots of the equation $f(x) = \|2x - 1\| - 5$ graphically. $x = \pm 4.243$	Find the zero(s) of the equation $g(x) = x + 2 - 2\sqrt{x+3}$ graphically. $x = 2.828$
Solve the equation $\sqrt{x+7} = -x^2 + 5$ graphically. $x = -1.638, x = 1.447$	Find the x-intercepts of the equation $\|x+5\| = \|x-3\|$ graphically. $x = -1$

More Practice

Zeros, Roots, and *X*-Intercepts

http://www.themathpage.com/aprecalc/roots-zeros-polynomial.htm

https://www.youtube.com/watch?v=yL-H9Sl8BVI

Homework Assignment

p.78 #39,41,43,47,48

SAT Connection

Solution

The correct answer is 100. Since $a = 5\sqrt{2}$, one can substitute $5\sqrt{2}$ for a in $2a = \sqrt{2}x$, giving $10\sqrt{2} = \sqrt{2}x$. Squaring each side of $10\sqrt{2} = \sqrt{2}x$ gives $(10\sqrt{2})^2 = (\sqrt{2}x)^2$, which simplifies to $(10)^2(\sqrt{2})^2 = (\sqrt{2}x)^2$, or $200 = 2x$. This gives $x = 100$. Checking $x = 100$ in the original equation gives $2(5\sqrt{2}) = \sqrt{(2)(100)}$, which is true since $2(5\sqrt{2}) = 10\sqrt{2}$ and $\sqrt{(2)(100)} = (\sqrt{2})(\sqrt{100}) = 10\sqrt{2}$.