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This lesson will walk you through how to solve a basic problem of this type. You will then tackle two problems on your own. Solve the following problems by isolating each side. You will work on problem like this example: 4 = √(2 + 2x) You will be given 10 problems to work on that follow a basic structure. Once you get the hang of 1 or 2 of these, it becomes pretty easy to follow and complete. Example: 8 = √(5 + 2x) Follow the steps to solve this equation: √(x + 8) = 3. This sheet provides you with plenty of opportunities to practice this skill. Solve the following radical equations and check and score your answers. Example: 6 = √(3 + 4x) 2. This is a good way to see how you are doing. This is an activity that you want to do as an entire class. It will allow you to see how the class is doing with the skill. Example: 5 = √(x + 15) This takes you through all the necessary steps needed to solve for variables found within radical equations. Example: √(x + 8) = 3 Solve the following problems by following the process that we already have described for you. Here is an example problem from this worksheet: 4 = √(2 + 2x) Remember to identify which variable has the greatest potential. Example: 8 = √(5 + 2x) Follow the steps to review how to solve the following equation: √(x + 8) = 3 This is the 2nd available quiz. We would suggest using this with slightly more advanced student than the 1st quiz. Example problems include: 6 = √(3 + 4x) This is perfect for introducing the topic or going back over it. Example: 5 = √(x + 15) Simply put, a radical equation is an equation that contains a radical sign somewhere within it. What is a radical? They are square roots denoted by the symbol'√.' They are also referred to as the root. Roots are the exact opposites of exponents. The number contained in the symbol √ is the number that is produced when a quantity is multiplied by itself. The number written on the left of the √ in a small size is called the degree or an index number. Degree numbers identify the radicals as either a square root, a cube root, or an nth root. The horizontal line of the radical on the right of the degree is called the vinculum. The radicand is the number we need to find the root of. The degree refers to the number of times a number will multiply to equal the radicand. Any equation that is below the vinculum is called a radical equation. Similarly, any expression below the vinculum is called a radical expression. Rules For Solving Them To solve them you need to know the rules that are related to this kind of math. These rules must be followed to solve these equations correctly. The answer should be positive if the number under the vinculum is positive. The answer should be negative if the number under the vinculum is negative. In the case of multiplication and division, If the radical for two numbers being multiplied or divided are the same, the numbers will multiply or divide without any change to the radical. The number under the vinculum can be split under two similar radicals. To remove a √ symbol, you need to power the radical with the same number as the degree. Finally, the radical is equal to the inverse of the degree number. The best way to approach determing these variables is to isolate it to one side of the equation and remove the radical. Example: √(3x + 6) – 6 = 0 To solve this, we first begin to isolate the variable by adding six to both sides. √(3x + 6) – 6 + 6 = 0 + 6√(3x + 6) = 6 Then, we remove the √ by squaring both sides [√(3x + 6)]2 = (6)23x + 6 = 363x = 36 – 63x = 30x = 10x = 3 Uses of These Types of Equations Radicals might seem like another one of those math things that you will never use in life, but that is not true. Radicals are used daily in many different fields. They are used in architecture, finance, engineering, and biology. In carpentry, they are used to calculate triangles used in constructing buildings. In engineering, electrical engineers often use radicals to find out how much electricity flows in a circuit. They are also used to better understand the nature of scientific and financial situations. In biology, scientists use them to find standard deviations when calculating statistical data. Real estate agents also use these types of equation to understand the inflation rate of homes in a particular to better understand the rate at which they are increasing in value. These are just some examples of how valuable this type of math is in the real world. This shows how important it is to learn them. There are a series of steps that we would encourage students to follow to make the path of solving these much easier and it will also give you a good handle on the process. Start by separating the radical expression that contains a variable. If you have multiples of this try to separate them individually. To just kick the radical to the curb, raise both sides of the equation to the index of the radical. If you have any remaining radicals, just rinse and repeat what we just did. At this point, you should just be dealing simple algebra that you would need to complete and solve for the individual variables. This process should become standard for you after a bit of practice. Use the worksheets found below to get in all the practice that you might need. We have eleven (11) radical equations lined up for you here. Each one is a bit different from the last. Dive in, and remember, it’s all about taking it one problem at a time. You’ve totally got this! Problem 1: Solve the radical equation below. [latex]\sqrt {2x \,- \,3} = – 1[/latex] Answer Since the square root of a real number must be positive, then this radical equation [latex]\color{red}\text{does not}[/latex] have a real solution. Notice the right-hand side is negative, that is, [latex]\color{red}-1[/latex]. Problem 2: Solve the radical equation below. [latex]\sqrt {x + 9} = 4[/latex] Answer Start by squaring both sides of the equation. Then subtract both sides by [latex]9[/latex]. Verify the answer by substituting it back to the original radical equation to check if it yields a true statement. Check [latex]x={\color{red}7}[/latex] It checks! Therefore, the solution is [latex]7[/latex]. Problem 3: Solve the radical equation below. [latex]\sqrt { – 3x + 1} \,- \,5 = – 3[/latex] Answer Add [latex]5[/latex] to both sides of the equation. Square both sides to eliminate the square root. Subtract [latex]1[/latex] from both sides. Finally, divide both sides by [latex]-3[/latex]. Validate [latex]x=-1[/latex] from the original radical equation. Therefore, [latex]x=-1[/latex] is a solution. Problem 4: Solve the radical equation below. [latex]\sqrt x \,- \,1 = 9\, – \,2x[/latex] Answer Start by isolating the square root term. Then, square both sides to eliminate the square root. Expand and simplify the resulting expression to form a quadratic equation. Factor out the trinomial to find the potential solutions. Finally, verify each solution by substituting it back into the original equation to ensure it is correct. The valid solution is identified through this verification process. I will leave it to you verify [latex]x=4[/latex] and [latex]x ={\Large{ {25 \over 4}}}[/latex] by substituting each back to the original radical equation. You should find out that the only valid answer is [latex]x=4[/latex]. Problem 5: Solve the radical equation below. [latex]\sqrt[3] { – 2x \,-\, 5} = – 3[/latex] Answer To solve the equation, first cube both sides to eliminate the cube root. Simplify the resulting equation and solve for [latex]x[/latex]. Verify the solution by substituting it back into the original equation to ensure it is correct. If it checks out, the solution is valid. Therefore, [latex]x=11[/latex] is a solution to the given radical equation. Problem 6: Solve the radical equation below. [latex]\sqrt {2x + 1} \sqrt {3x \,- \,1} = 2[/latex] Answer To solve the radical equation, square both sides to eliminate the square roots. Multiply the binomials on the left side which resulting to quadratic equation. Simplify the terms, then use the factoring to find the solutions. Verify each solution in the original equation and identify the valid ones. Note that the only solution is [latex]x = {\Large{ {5 \over 6}}}[/latex] which makes [latex]x=-1[/latex] an extraneous solution. Problem 7: Solve the radical equation below. [latex]\sqrt {4x\, – \,3} = 2x\, – \,9[/latex] Answer To solve the equation, first square both sides to eliminate the square root, then expand the right side. Move all terms to one side to form a quadratic equation and simplify it. Use the factoring method to solve for [latex]x[/latex]. Verify each solution by substituting it back into the original radical equation to check for validity. Determine which solutions satisfy the original equation and conclude with the valid one. Here, [latex]x=3[/latex] is not a valid solution. The only solution is [latex]x=7[/latex]. Problem 8: Solve the radical equation below. [latex]\sqrt {2{x^2} \,- \,5x \,- \,7} = x + 1[/latex] Answer To solve the given equation, we first square both sides to eliminate the square root, then simplify the resulting equation. Next, we bring all terms to one side to set the equation to zero and solve the resulting quadratic equation using the factoring method. We then check each solution in the original equation to ensure they do not produce extraneous solutions. After verification, we determine that both solutions satisfy the original equation. Thus, the solutions are [latex]x=8[/latex] and [latex]x=-1[/latex]. Problem 9: Solve the radical equation below. [latex]\sqrt {3x + 1} = \sqrt {2x \,- \,1} + 1[/latex] Answer We start by squaring both sides of the equation to eliminate the square roots. After simplifying, we isolate the square root term once more on the right side of the equation. Then, we square both sides again to remove the square root term, resulting in a quadratic equation. We simplify this quadratic equation and proceed to solve it by factoring. Lastly, we verify the obtained solutions by substituting them back into the original equation. Therefore, the solutions are [latex]x=5[/latex] and [latex]x=1[/latex]. Problem 10: Solve the radical equation below. [latex]\sqrt {x + 2} \,+ \,\sqrt {x\, – \,3} = 5[/latex] Answer Get rid of the square roots by squaring both sides of the equation. We will have to do it twice. Eventually, the quadratic term [latex]x^2[/latex] will be eliminated leaving a linear equation to solve which is very easy to address. Verify that [latex]x=7[/latex] is a solution to the radical equation. Problem 11: Solve the radical equation below. [latex]\sqrt {2x \,- \,2} + \sqrt {2x + 7} = \sqrt {3x + 12}[/latex] Answer Square both sides of the equation. Simplify, then square both sides again to eliminate the square roots. Next, move all terms to the left side to set the right side equal to zero. Factor the trinomial on the left into two binomials. Lastly, set each binomial equal to zero to solve for [latex]x[/latex]. We need to verify our solutions from the original radical equation. We should find out that [latex]x ={\Large{ {7 \over 5}}}[/latex] is true while [latex]x=-5[/latex] is false. Therefore, the only solution is [latex]x ={\Large{ {7 \over 5}}}[/latex]. You might also like these tutorials: Tags: Intermediate Algebra, Lessons Summary Previous Question Show Hints 3 / 3 x^2 x^3 x^{\msquare} \frac{\msquare}{\msquare} \sqrt{\square} throot[\msquare]{\square} \log_{\msquare} \ln \pi \le \ge \mathrm{No\:Solution} Skip topic Skip problem Verify Cheat Sheets Start Quiz 00:00:00 Previous Question 1 / 10 x^2 x^3 x^{\msquare} \frac{\msquare}{\msquare} \sqrt{\square} throot[\msquare]{\square} \log_{\msquare} \ln \pi \le \ge \mathrm{No\:Solution} Finish Quiz Back Sorry, your browser does not support this application You haven't collected any crowns yet Page ID45459 A: Radical Equations (I) Exercise \(\PageIndex{A}\) \(\bigstar \) Solve. \(\sqrt { x } = 7\) \(\sqrt { x } = 4\) \(\sqrt { x } + 8 = 9\) \(\sqrt { x } - 4 = 5\) \(\sqrt { x } + 7 = 4\) \(\sqrt { x } + 3 = 1\) \(5 \sqrt { x } - 1 = 0\) \(3 \sqrt { x } - 2 = 0\) \(\sqrt { 3 x + 1 } = 2\) \(\sqrt { 5 x - 4 } = 4\) \(\sqrt { 7 x + 4 } + 6 = 11\) \(\sqrt { 3 x - 5 } + 9 = 14\) \(2 \sqrt { x - 1 } - 3 = 0\) \(3 \sqrt { x + 1 } - 2 = 0\) \(\sqrt { x + 1 } = \sqrt { x } + 1\) \(\sqrt { 2 x - 1 } = \sqrt { 2 x } - 1\) \(\sqrt { 4 x - 1 } = 2 \sqrt { x } - 1\) \(\sqrt { 4 x - 11 } = 2 \sqrt { x } - 1\) \(\sqrt { x + 8 } = \sqrt { x } - 4\) \(\sqrt { 25 x - 1 } = 5 \sqrt { x } + 1\) \(\sqrt { 3 } { x } = 3\) \(\sqrt { 3 } { x } = - 4\) \(\sqrt { 3 } { 2 x + 9 } = 3\) \(\sqrt { 3 } { 4 x - 11 } = 1\) \(\sqrt { 3 } { 5 x + 7 } + 3 = 1\) \(\sqrt { 3 } { 3 x - 6 } + 5 = 2\) \(4 - 2 \sqrt { 3 } { x + 2 } = 0\) \(6 - 3 \sqrt { 3 } { 2 x - 3 } = 0\) \(\sqrt { 5 } { 3 (x + 10) } = 2\) \(\sqrt { 5 } { 4 x + 3 } + 5 = 4\) Answers to odd exercises: 1. \(49\) 3. \(1\) 5. \(Ø\) 7. \(\frac{1}{25}\) 9. \(1\) 11. \(3\) 13. \(\frac{13}{4}\) 15. \(0\) 17. \(\frac{1}{4}\) 19. \(Ø\) 21. \(27\) 23. \(9\) 25. \(−3\) 27. \(6\) 29. \(\frac{2}{3}\). B: Radical Equations (II) Exercise \(\PageIndex{B}\) \(\bigstar \) Solve. \(\sqrt { 8 x + 11 } = 3 \sqrt { x + 1 }\) \(2 \sqrt { 3 x - 4 } = \sqrt { 2 (3 x + 1) }\) \(\sqrt { 2 (x + 10) } = \sqrt { 7 x - 15 }\) \(\sqrt { 5 (x - 4) } = \sqrt { x + 4 }\) \(\sqrt { 3 } { 5 x - 2 } = \sqrt { 3 } { 4 x }\) \(\sqrt { 3 } { 9 (x - 1) } = \sqrt { 3 } { 3 (x + 7) }\) \(\sqrt { 3 } { 3 x + 1 } = \sqrt { 3 } { 2 (x - 1) }\) \(\sqrt { 3 } { 9 x } = \sqrt { 3 } { 3 (x - 6) }\) \(\sqrt { 5 } { 3 x - 5 } = \sqrt { 5 } { 2 x + 8 }\) \(\sqrt { 5 } { x + 3 } = \sqrt { 5 } { 2 x + 5 }\) Answers to odd exercises: 31. \(2\) 33. \(7\) 35. \(2\) 37. \(−3\) 39. \(13\). C: Radical Equations (III) Exercise \(\PageIndex{C}\) \(\bigstar \) Solve. \(\sqrt { 4 x + 21 } = x\) \(\sqrt { 8 x + 9 } = x\) \(\sqrt { 4 (2 x - 3) } = x\) \(\sqrt { 3 (4 x - 9) } = x\) \(2 \sqrt { x - 1 } = x\) \(3 \sqrt { 2 x - 9 } = x\) \(\sqrt { 9 x + 9 } = x + 1\) \(\sqrt { 3 x + 10 } = x + 4\) \(\sqrt { x - 1 } = x - 3\) \(\sqrt { 2 x - 5 } = x - 4\) \(\sqrt { 16 - 3 x } = x - 6\) \(\sqrt { 7 - 3 x } = x - 3\) \(3 \sqrt { 2 x + 10 } = x + 9\) \(2 \sqrt { 2 x + 5 } = x + 4\) \(3 \sqrt { x - 1 } - 1 = x\) \(2 \sqrt { 2 x + 2 } - 1 = x\) \(\sqrt { 10 x + 41 } - 5 = x\) \(\sqrt { 6 (x + 3) } - 3 = x\) \(\sqrt { 8 x ^ { 2 } - 4 x + 1 } = 2 x\) \(\sqrt { 18 x ^ { 2 } - 6 x + 1 } = 3 x\) \(5 \sqrt { x + 2 } = x + 8\) \(4 \sqrt { 2 (x + 1) } = x + 7\) \(\sqrt { x ^ { 2 } - 25 } = x\) \(\sqrt { x ^ { 2 } + 9 } = x\) \(3 + \sqrt { 6 x - 11 } = x\) \(2 + \sqrt { 9 x - 8 } = x\) \(\sqrt { 4 x + 25 } - x = 7\) \(\sqrt { 8 x + 73 } - x = 10\) \(2 \sqrt { 4 x + 3 } - 3 = 2 x\) \(2 \sqrt { 6 x + 3 } - 3 = 3 x\) \(2 x - 4 = \sqrt { 14 - 10 x }\) \(3 x - 6 = \sqrt { 33 - 24 x }\) \(\sqrt [3] { x ^ { 2 } - 24 } = 1\) \(\sqrt [3] { x ^ { 2 } - 54 } = 3\) \(\sqrt [3] { x ^ { 2 } + 6 x } + 1 = 4\) \(\sqrt [3] { x ^ { 2 } + 2 x } + 5 = 7\) \(\sqrt [3] { 25 x ^ { 2 } - 10 x - 7 } = - 2\) \(\sqrt [3] { 9 x ^ { 2 } - 12 x - 23 } = - 3\) \(\sqrt [3] { 4 x ^ { 2 } - 1 } - 2 = 0\) \(4 \sqrt [3] { x ^ { 2 } } - 1 = 0\) \(\sqrt [5] { x (2 x + 1) } - 1 = 0\) \(\sqrt [5] { 3 x ^ { 2 } - 20 x } - 2 = 0\) Answers to odd exercises: 41. \(7\) 43. \(2, 6\) 45. \(2\) 47. \(−1, 8\) 49. \(5\) 51. \(Ø\) 53. \(−3, 3\) 55. \(2, 5\) 57. \(−4, 4\) 59. \(\frac{1}{2}\) 61. \(2, 7\) 63. \(Ø\) 65. \(10\) 67. \(−6, −4\) 69. \(−\frac{1}{2}, \frac{3}{2}\) 71. \(Ø\) 73. \(−5, 5\) 75. \(−9, 3\) 77. \(\frac{1}{5}\) 79. \(− \frac{3}{2} ,\frac{ 3}{2}\) 81. \(−1, \frac{1}{2}\) D: Radical Equations (IV) Exercise \(\PageIndex{D}\) \(\bigstar \) Solve. \(\sqrt { 2 x ^ { 2 } - 15 x + 25 } = \sqrt { (x + 5) (x - 5) }\) \(\sqrt { x ^ { 2 } - 4 x + 4 } = \sqrt { x (5 - x) }\) \(\sqrt [3] { 2 \left(x ^ { 2 } + 3 x - 20 \right) } = \sqrt [3] { (x + 3) ^ { 2 } }\) \(\sqrt [3] { 3 x ^ { 2 } + 3 x + 40 } = \sqrt [3] { (x - 5) ^ { 2 } }\) \(\sqrt { 2 x - 5 } + \sqrt { 2 x } = 5\) \(\sqrt { 4 x + 13 } - 2 \sqrt { x } = 3\) \(\sqrt { 8 x + 17 } - 2 \sqrt { 2 - x } = 3\) \(\sqrt { 3 x - 6 } - \sqrt { 2 x - 3 } = 1\) \(\sqrt { 2 (x - 2) } - \sqrt { x - 1 } = 1\) \(\sqrt { 2 x + 5 } - \sqrt { x + 3 } = 2\) \(\sqrt { 2 (x + 1) } - \sqrt { 3 x + 4 } - 1 = 0\) \(\sqrt { 6 - 5 x } + \sqrt { 3 - 3 x } - 1 = 0\) \(\sqrt { x - 2 } - 1 = \sqrt { 2 (x - 3) }\) \(\sqrt { 14 - 11 x } + \sqrt { 7 - 9 x } = 1\) \(\sqrt { x + 1 } = \sqrt { 3 } - \sqrt { 2 - x }\) \(\sqrt { 2 x + 9 } - \sqrt { x + 1 } = 2\) Answers to odd exercises: 83. \(5, 10\) 85. \(−7, 7\) 87. \(\frac{9}{2}\) 89. \(1\) 91. \(10\) 93. \(Ø\) 95. \(3\) 97. \(-1, 2\). Exercise \(\PageIndex{E}\) \(\bigstar \) Solve. \(x ^ { 1 / 2 } - 10 = 0\) \(x ^ { 1 / 2 } - 6 = 0\) \(x ^ { 1 / 3 } + 2 = 0\) \(x ^ { 1 / 3 } + 4 = 0\) \((x - 1) ^ { 1 / 2 } - 3 = 0\) \((x + 2) ^ { 1 / 2 } - 6 = 0\) \((2 x - 1) ^ { 1 / 3 } + 3 = 0\) \((3 x - 1) ^ { 1 / 3 } - 2 = 0\) \((4 x + 15) ^ { 1 / 2 } - 2 x = 0\) \((3 x + 2) ^ { 1 / 2 } - 3 x = 0\) \((2 x + 12) ^ { 1 / 2 } - x = 6\) \((4 x + 36) ^ { 1 / 2 } - x = 9\) \(2 (5 x + 26) ^ { 1 / 2 } = x + 10\) \(3 (x - 1) ^ { 1 / 2 } = x + 1\) \(x ^ { 1 / 2 } + (3 x - 2) ^ { 1 / 2 } = 2\) \((6 x + 1) ^ { 1 / 2 } - (3 x) ^ { 1 / 2 } = 1\) \((3 x + 7) ^ { 1 / 2 } + (x + 3) ^ { 1 / 2 } - 2 = 0\) \((3 x) ^ { 1 / 2 } + (x + 1) ^ { 1 / 2 } - 5 = 0\) \(\sqrt{3x+7} +\sqrt{x+1} = 2 \) \(\sqrt{2x+4} - \sqrt{x+3} =1\) \(\sqrt{2x}-\sqrt{x+1}=1 \) Answers to odd exercises: 99. \(100\) 101. \(−8\) 103. \(10\) 105. \(−13\) 107. \(\frac{5}{2}\) 109. \(−6, −4\) 111. \(−2, 2\) 113. \(1\) 115. \(−2\) 117. {-1} 119. {8} \(\star\) Was this article helpful? Recommended articles Directions: Solve the following problems dealing with radical equations. Show your work algebraically. Remember that you can use your graphing calculator to check your answers. 1. 2. 3. 4. 5. 6. Find the solution set of the equation . 7. Solve for x: 8. Find the solution set of the equation. 9. Solve for x: 10. If, find the numerical value of (5 - a)2.

NOTE: The re-posting of materials (in part or whole) from this site to the Internet is copyright violation and is not considered "fair use" for educators. Please read the "Terms of Use". Mobile Notice You appear to be on a device with a "narrow" screen width (i.e. you are probably on a mobile phone). Due to the nature of the mathematics on this site it is best viewed in landscape mode. If your device is not in landscape mode many of the equations will run off the side of your device (you should be able to scroll/swipe to see them) and some of the menu items will be cut off due to the narrow screen width. Solve each of the following equations.