

Class Ex. #4

Solve the following radical equation.

$$\sqrt{x} + \sqrt{x-3} = 5$$

Complete Assignment Question #5 - #11

## Assignment

1. Algebraically, determine any restrictions on values of the variable in these radical equations.

a)  $\sqrt{3x-9} = 5$

$3x-9 \geq 0$

$x \geq 3$

b)  $\sqrt{2+x} + 13 = 0$

$2+x \geq 0$

$x \geq -2$

c)  $\sqrt{1-x} - \sqrt{4-x} = -1$

$1-x \geq 0$

$x \leq 1$

$4-x \geq 0$

$x \leq 4$

$x \leq 1$

d)  $\sqrt{2x+9} + \sqrt{1-2x} = 4$

$2x+9 \geq 0$

$x \geq -\frac{9}{2}$

$1-2x \geq 0$

$x \leq \frac{1}{2}$

$-\frac{9}{2} \leq x \leq \frac{1}{2}$

e)  $\sqrt{7x-2} = \sqrt{7-6x}$

$7x-2 \geq 0$

$x \geq \frac{2}{7}$

$7-6x \geq 0$

$x \leq \frac{7}{6}$

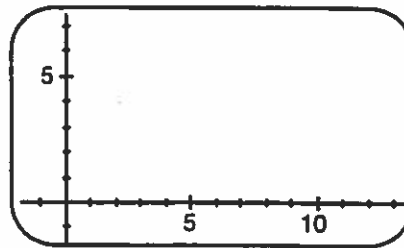
$\frac{2}{7} \leq x \leq \frac{7}{6}$

2. Consider the equation  $\sqrt{x} = \sqrt{33 - 3x}$ .

a) Determine the values of  $x$  for which the radical equation is defined.

$$x \geq 0 \quad x \leq 11$$

$$0 \leq x \leq 11$$



b) Complete the following statement.

"The grid provided shows the window  $x:[0, 13, 1]$   $y:[0, 7, 1]$ ."

c) Solve the equation graphically, giving the root(s) to the nearest hundredth. Sketch and label the displayed graphs on the grid.

d) Verify the solution algebraically.

3. Describe how to solve the radical equation  $\sqrt{6x + 4} = 3x - 1$  using the intersection feature of the calculator. State the solution of the equation to the nearest tenth.

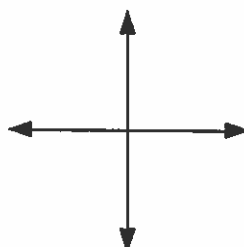
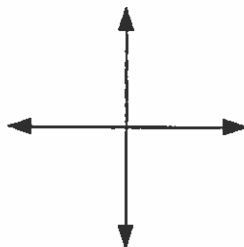
4. For each of the following radical equations:

i) Determine the values of the variable for which the radical equation is defined.

ii) Solve the radical equation graphically. If the solution is not rational, answer to the nearest hundredth. Sketch and label your calculator graph(s) on the grid.

a)  $\sqrt{3x - 7} = x - 5$

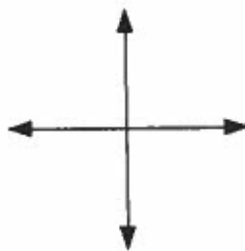
b)  $\sqrt{x + 5} - 2\sqrt{x} = 2$



c)  $\sqrt{2(1-5x)} - 3 = 0$

d)  $\sqrt{3-p} = 1 + \sqrt{2p+5}$

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● Solve the following radical equations algebraically.

a)  $\sqrt{x-7} = 8$      $x \geq 7$   
 $x-7 = 64$   
 $x = 71$

b)  $\sqrt{2y+3} = 4$      $x = -\frac{3}{2}$   
 $2y+3 = 16$   
 $\quad -3 \quad -3$   
 $2y = 13$   
 $y = \frac{13}{2}$

c)  $\sqrt{\frac{3x-2}{5}} = 6$      $x \geq \frac{2}{3}$   
 $\frac{3x-2}{5} = 36$  (5)  
 $3x-2 = 180$   
 $\quad +2 \quad +2$   
 $3x = 182$   
 $x = \frac{182}{3}$

d)  $4 + \sqrt{x-2} = x$      $x \geq 2$   
 $\sqrt{x-2} = (x-4)$   
 $x-2 = x^2 - 8x + 16$   
 $-1x + 2 \quad -1x + 2$   
 $= x^2 - 9x + 18$   
 $(x-3)(x-6)$   
 $x = \underline{3, 6}$

Algebraically determine the solution to the following radical equations.

a)  $\sqrt{19a+6} - 2a = 3$   $a^2 = -6/19$

$$\sqrt{19a+6} = (2a+3)^2$$

$$(2a+3)(2a+3)$$

$$19a+6 = 4a^2+12a+9$$

$$-4a^2 - 6 = -4a^2 - 7a + 3$$

$$4a^2 - 3a - 4a + 3$$

$$a(4a-3) - 1(4a-3)$$

$$(a-1)(4a-3) = 0$$

$$a = 1, 3/4$$

b)  $x^2 = (2\sqrt{2x-4})^2$

$$x \geq \frac{4}{2}$$

$$x^2 = 4(2x-4)$$

$$x \geq 2$$

$$x^2 = 8x - 16$$

$$x^2 - 8x + 16 = 0$$

$$(x-4)(x-4) = 0$$

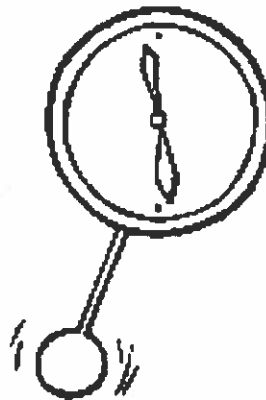
$$x = 4$$

Use the following information to answer Question #7.

The time it takes for a pendulum to swing back and forth (the period) depends on the length of

the pendulum. The formula  $T = 2\pi\sqrt{\frac{L}{g}}$  is used

to determine the period (in seconds) of a pendulum of length  $L$  metres.  $g$  is the acceleration due to gravity ( $g = 9.81 \text{ m/s}^2$ ).



a) Determine the period, to the nearest 0.01 seconds, of a pendulum of length 0.5 metres.

$$T = 2\pi\sqrt{\frac{0.5}{9.81}}$$

$$= 1.42 \text{ s}$$

b) Determine, to the nearest centimetre, the length of a pendulum whose period is 1 second.

$$\frac{1}{2\pi} = \frac{2\pi\sqrt{\frac{l}{9.81}}}{2\pi}$$

$$\left(\frac{1}{2\pi}\right)^2 = \frac{l}{9.81}$$

$$l = 0.24849 \text{ m}$$

$$= 25 \text{ cm}$$

Solve the following radical equations.

a)  $3 - \sqrt{3x+4} = 4$   $x \geq -\frac{4}{3}$

$$\begin{array}{r} -3 \\ (-\sqrt{3x+4})^2 = 1^2 \end{array}$$

$$\begin{array}{r} 3x+4 = 1 \\ -4 \quad -4 \end{array}$$

$$\begin{array}{r} 3x = -3 \\ \frac{3}{3} \quad \frac{-3}{3} \end{array}$$

$$x = -1$$

verify

$$3 - \sqrt{3(-1)+4} = 4$$

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

$$3 - 1 = 4$$

b)  $2\sqrt{21x^2+50x} = \left(\frac{8}{2}\right)^2$

$$21x^2 + 50x = 16$$

$$21x^2 + 50x - 16 = 0$$

$$21x^2 + 56x - 6x - 16$$

$$7x(3x+8) - 2(3x+8)$$

$$(7x-2)(3x+8) = 0$$

$$x = \frac{2}{7}, -\frac{8}{3}$$

$$\begin{array}{r} +1 \ 1 \\ 50 \overline{) -336} \\ \underline{-50} \phantom{0} \\ -656 \end{array}$$

no soln

When solving the equation  $(x-3)^2 = (\sqrt{x-1})^2$ , the extraneous root is

- A. -2
- B. 2**
- C. -5
- D. 5

$$\begin{array}{r} x^2 - 6x + 9 = x - 1 \\ -1x + 1 \quad -1 + 1 \end{array}$$

$$x^2 - 7x + 10$$

$$(x-5)(x-2)$$

$$x = 5, 2$$

$$\begin{array}{l} x = 5 \\ 5 - 3 = \sqrt{5-1} \\ 2 = 2 \checkmark \end{array}$$

$$\begin{array}{l} x = 2 \\ 2 - 3 = \sqrt{2-1} \\ -1 = \sqrt{1} \\ \text{X} \end{array}$$

10. The solution to the radical equation  $\sqrt{x+3} = \sqrt{x^2-17}$  is  $x^2 = 17$   $x \geq \pm\sqrt{17}$   $x \geq -3$

- A.  $x = -4$  only
- B.  $x = 5$  only**
- C.  $x = -4, 5$
- D.  $x = -5, 4$

$$\begin{array}{r} x+3 = x^2-17 \\ -x-3 \quad \quad -3 \quad -x \end{array}$$

$$= x^2 - x - 20$$

$$= (x-5)(x+4)$$

$$x = 5, -4$$

Numerical Response

When the solution to the radical equation  $6\sqrt{x-2} = 4\sqrt{x+8}$  is verified, the value of each side of the equation, to the nearest tenth, is 17.0.

(Record your answer in the numerical response box from left to right.)

17.0

$$36(x-2) = 16(x+8)$$

$$36x - 72 = 16x + 128$$

$$20x = 200$$

$$x = 10$$

$$6\sqrt{10-2}$$

$$6\sqrt{8} = 16.97056$$

**Answer Key**

1. a)  $x \geq 3, x \in R$

b)  $x \geq -2, x \in R$

c)  $x \leq 1, x \in R$

d)  $-\frac{9}{2} \leq x \leq \frac{1}{2}, x \in R$

e)  $\frac{2}{7} \leq x \leq \frac{7}{6}, x \in R$

2. a)  $0 \leq x \leq 11, x \in R$

b)  $x: [-1, 13, 1], y: [-1, 7, 1]$

c) 8.25

d)  $LS = \sqrt{8.25}, RS = \sqrt{33 - 3(8.25)} = \sqrt{8.25}, LS = RS$

3. • Graph  $Y_1 = \sqrt{6x+4}$  • Graph  $Y_2 = -3x+1$

• Find the  $x$ -coordinate(s) of the point(s) of intersection using the intersect feature of the calculator.

• Solution is  $x = 1.5$

4. a)  $x \geq \frac{7}{3}, x \in R. 9.70$

b)  $x \geq 0, x \in R. 0.01$

c)  $x \leq \frac{1}{5}, x \in R. -\frac{7}{10}$

d)  $-\frac{5}{2} \leq p \leq 3, p \in R. -1.79$

5. a) 71

b)  $\frac{13}{2}$

c)  $\frac{182}{3}$

d) 6

6. a)  $\frac{3}{4}$  or 1

b) 4

7. a) 1.42 seconds

b) 25 cm

8. a) no solution

b)  $-\frac{8}{3}$  or  $\frac{2}{7}$

9. B

10. B

11.

1 7 . 0