



# WORKBOOK

<http://agb.gymnaslo.cz>



**Subject:** Mathematics

**Student:** .....

**School year:** ...../.....

## Topic: Radical Equations

### Equations with square root - Radical Equations

1. Find all real solutions to the equation  $\sqrt{x+1} = 4$

We raise both sides to power 2 in order to clear the square root.

$$[\sqrt{x+1}]^2 = 4^2$$

and simplify  $x + 1 = 16$

Solve for x.  $x = 15$



NOTE: Since we squared both sides without putting any conditions, extraneous solutions may be introduced, checking the solutions is necessary.

Left side (LS) of the given equation when  $x = 15$

$$LS = \sqrt{x+1} = \sqrt{15+1} = 4$$

Right Side (RS) of the given equation when  $x = 15$

$$RS = 4$$

For  $x = 15$ , the left and the right sides of the given equation are equal:  $x = 15$  is a solution to the given equation.

## 2. Find all real solutions to the equation $\sqrt{3x+1} = x-3$

Given

$$\sqrt{3x+1} = x-3$$

We raise both sides to power 2.

$$[\sqrt{3x+1}]^2 = (x-3)^2$$

and simplify

$$3x+1 = x^2 - 6x + 9$$

Write the equation with right side equation to 0  $x^2 - 9x + 8 = 0$

It is a quadratic equation with 2 solutions  $x = 8$  and  $x = 1$

NOTE: Since we squared both sides, extraneous solutions may be introduced, checking the solutions in the original equation is necessary.

1. check equation for  $x = 8$ .

Left side (LS) of the given equation when  $x = 8$

$$LS = \sqrt{3x+1} = \sqrt{3 \cdot 8 + 1} = 5$$

Right Side (RS) of the given equation when  $x = 8$

$$RS = x - 3 = 8 - 3 = 5$$

2. check equation for  $x = 1$ .

Left side (LS) of the given equation when  $x = 1$

$$LS = \sqrt{3x+1} = \sqrt{3 \cdot 1 + 1} = 2$$

Right Side (RS) of the given equation when  $x = 1$

$$RS = x - 3 = 1 - 3 = -2$$



For  $x = 8$  the left and right sides of the equation are equal and  $x = 8$  is a solution to the given equation.  $x = 1$  is not a solution to the given equation; it is an extraneous solution introduced because of the raising to power 2.

Solve the following equations and the answer check!

1.  $\sqrt{5x-9} = x-1$   $x = 5 ; 2$

2.  $\sqrt{2x-1} + 5 = 2$  *no solution*

3.  $x-3 = \sqrt{30-2x}$   $x = 7$

4.  $\sqrt{5x+3} = \sqrt{3x+7}$   $x = 2$

5.  $2\sqrt{x+8} = 3\sqrt{x-2}$   $x = 10$

6.  $\sqrt{x+5} = \sqrt{x^2-15}$   $x = 5, -4$

Uses:

<http://www.purplemath.com>

<http://www.regentsprep.org>

<http://www.algebra.com>

agb.gymnaslo.cz



INVESTICE DO ROZVOJE VZDĚLÁVÁNÍ

TENTO PROJEKT JE SPOLUFINANCOVÁN EVROPSKÝM SOCIÁLNÍM FONDĚM A STÁTNÍM ROZPOČTEM ČESKÉ REPUBLIKY