

Working Example 2: Explore a Radical Equation Involving an Extraneous Root

Solve the equation $3 + \sqrt{x-1} = x$ algebraically.

Solution

a) State the restrictions for the variable: _____.

What restriction have you identified? Why are there only restrictions for the variable under the radical?

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

$$3 - \underline{\hspace{2cm}} + \sqrt{x-1} = x - \underline{\hspace{2cm}}$$

Isolate the radical.

$$\sqrt{x-1} = \underline{\hspace{2cm}}$$

$$(\sqrt{x-1})^2 = (x - \underline{\hspace{2cm}})^2$$

Square both sides.

$$x - 1 = (x - \underline{\hspace{2cm}})(x - \underline{\hspace{2cm}})$$

$$0 = x^2 - \underline{\hspace{2cm}}x + \underline{\hspace{2cm}} - x + 1$$

Equate to 0.

$$0 = x^2 - \underline{\hspace{2cm}}x + \underline{\hspace{2cm}}$$

Combine like terms.

$$0 = (x - \underline{\hspace{2cm}})(x - \underline{\hspace{2cm}})$$

Factor and solve.

$$(x - \underline{\hspace{2cm}}) = 0 \quad \text{or} \quad (x - \underline{\hspace{2cm}}) = 0$$

$$x = \underline{\hspace{2cm}}$$

$$x = \underline{\hspace{2cm}}$$

Check against the restriction and by substituting the value(s) in the original equation.

For $x = \underline{\hspace{2cm}}$

For $x = \underline{\hspace{2cm}}$

Left Side	Right Side

Left Side	Right Side

Left Side _____ Right Side
(= or ≠)

Left Side _____ Right Side
(= or ≠)

The root $x = \underline{\hspace{2cm}}$ does not satisfy the original equation, so it is
an _____ root.



To see a similar question, refer to Example 2 on pages 92 in *Pre-Calculus 12*.