ASSIGNMENT 1

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PROBLEM 9(b):-Using Properties of proportion solve for x, given

$$\frac{\sqrt{5x}+\sqrt{2x-6}}{\sqrt{5x}-\sqrt{2x-6}} = 4$$

SOLUTION:-

Using Componendo and Dividendo rule that is if $\frac{a}{b} = \frac{c}{d} \implies \frac{a+b}{a-b} = \frac{c+d}{c-d}$; on the given expression

$$\frac{\sqrt{5x}+\sqrt{2x-6}}{\sqrt{5x}-\sqrt{2x-6}} = \frac{4}{1}$$

$$\frac{\sqrt{5x}+\sqrt{2x-6}+\sqrt{5x}-\sqrt{2x-6}}{\sqrt{5x}+\sqrt{2x-6}-\sqrt{5x}+\sqrt{2x-6}} = \frac{4+1}{4-1} \quad (1)$$

$$\frac{2\sqrt{5x}}{2\sqrt{2x-6}} = \frac{5}{3} \quad (2)$$

$$3(\sqrt{5x}) = 5(\sqrt{2x-6}) \quad (3)$$

$$9 \times 5x = 5 \times 5 \times (2x-6) \quad (4)$$

$$9x = 10x - 30 \quad (5)$$

$$\implies \boxed{x = 30} \quad (6)$$

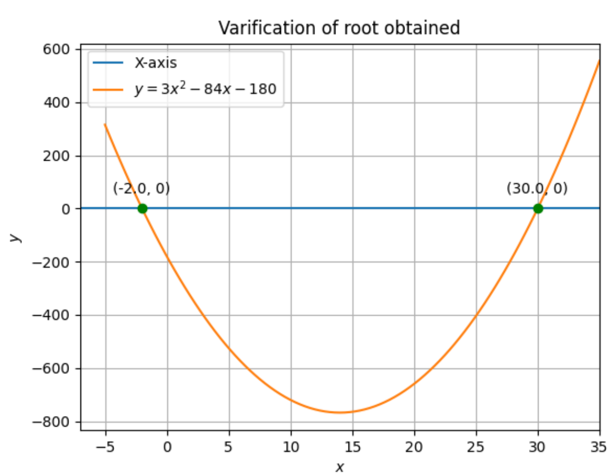

Fig. 1. Zeroes of $f(x) = 0$ are intersections of $f(x)$ with $x - axis$

In order to varify the solution using graph we can reduce the given form into a polynomial form by rationalization and squaring .By doing these operations along with simplification we get a quaderatic equation

$$3x^2 - 84x - 180 = 0 \quad (7)$$

whose roots are -2 and 30 as the graph cuts $x - axis(y = 0$ line) at $x = -2$ and $x = 30$. But since we have squared the original equation ,so one extra root which is$x = -2$,we are getting. Also one can see the domain of original equation is$[3, \infty]$ since the value inside square root cannot be negative real number.

Since at $x = 30$ the graph cuts the $x - axis \implies x = 30$ is solution for given equation.