Assignment 1

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Question 6 (a) :

Using properties of proportion , solve for x. Given x is positive :

$$\frac{2x+\sqrt{4x^2-1}}{2x-\sqrt{4x^2-1}} = 4 \tag{1}$$

Solution:

From the properties of proportion

$$\frac{a}{b} = \frac{c}{d} \Rightarrow \frac{a+b}{a-b} = \frac{c+d}{c-d} \tag{2}$$

The Given Equation is :

$$\frac{2x+\sqrt{4x^2-1}}{2x-\sqrt{4x^2-1}} = \frac{4}{1} \tag{3}$$

From (2)

$$\frac{2x+\sqrt{4x^2-1}+2x-\sqrt{4x^2-1}}{2x+\sqrt{4x^2-1}-2x+\sqrt{4x^2-1}} = \frac{4+1}{4-1} \tag{4}$$

$$\Rightarrow \frac{4x}{2\sqrt{4x^2-1}} = \frac{5}{3} \tag{5}$$

$$\Rightarrow \frac{6x}{5} = \sqrt{4x^2-1} \tag{6}$$

$$\Rightarrow \frac{36x^2}{25} = 4x^2-1 \tag{7}$$

$$\Rightarrow 1 = \left(4-\frac{36}{25}\right)x^2 \tag{8}$$

$$\Rightarrow x^2 = \frac{25}{64} \tag{9}$$

$$\Rightarrow x = \pm\frac{5}{8} \tag{10}$$

But Given x is positive

$$\Rightarrow x = \frac{5}{8} \tag{11}$$

Verification with Graph:

If we draw the graph of y = f(x) = $\frac{2x+\sqrt{4x^2-1}}{2x-\sqrt{4x^2-1}}$ and find point of intersection with $y = 4$,
we get $x = 0.625 = \frac{5}{8}$
$\therefore x = \frac{5}{8} = 0.625$

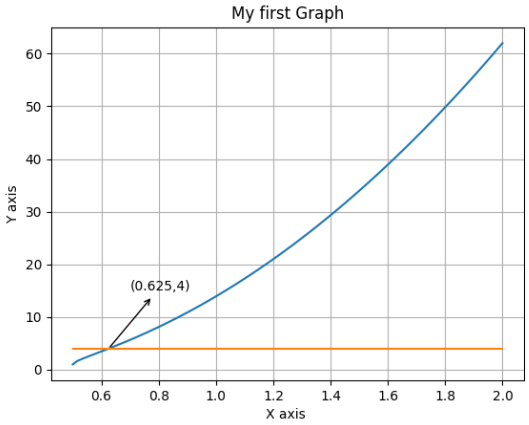

Figure 1: graph of y = f(x)