



IIT Madras
ONLINE DEGREE

Mathematics for Data Science 1

Week 05 - Tutorial 01

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1. Two curves representing the functions $y_1 = a_1x^2 + b_1x + c$ and $y_2 = a_2x^2 + b_2x + c$ intersect each other at two points, then what will be their x -coordinates?

$y_1 = y_2$

$$a_1x^2 + b_1x + c = a_2x^2 + b_2x + c$$
$$\Rightarrow (a_1 - a_2)x^2 + (b_1 - b_2)x = 0$$
$$\Rightarrow x \left[(a_1 - a_2)x + (b_1 - b_2) \right] = 0$$
$$\underline{x = 0} \quad \boxed{x = \frac{b_1 - b_2}{-(a_1 - a_2)}} \quad a_1 \neq a_2$$

Hello Mathematics students, in this week's tutorial we will look at question related to quadratic functions. In our first question here we have two quadratic functions given to us and they intersect each other at two points and what will be their x coordinates. Clearly if they intersecting each other that means the x and y will be same. So, that is mean $y_1 = y_2$ and this is what we are trying to solve for.

So, $a_1x^2 + b_1x + c$ should be equal to $a_2x^2 + b_2x + c$ and the x is supposed to be same. So, anyway we can cancel off the c here. So this gives us $(a_1 - a_2)x^2 + (b_1 - b_2)x = 0$. This would imply this is us $x[(a_1 - a_2)x + (b_1 - b_2)] = 0$. So, this corresponds to two different solutions. So, if we took this part to be 0 then $x = 0$ as one solution.

And the next will give us $x = \frac{b_1 - b_2}{-(a_1 - a_2)}$. So, this is a product of two terms and that product of two terms is 0 which means either of two terms has to be 0. So, one solution is x being 0 and the other one you get this as the solution. Now this is only a valid solution if a_1 and a_2 are not equal because a denominator cannot be 0. Therefore, $a_1 \neq a_2$ is a condition that needs to be satisfied.

So, these are the two x coordinates one is 0 and the other is $\frac{b_1 - b_2}{a_2 - a_1}$.