INDIAN INSTITUTE OF TECHNOLOGY MADRAS

सिद्धिर्भवति कर्मजा

IIT Madras

ONLINE DEGREE

Mathematics for Data Science 1
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Week - 04
Tutorial - 01

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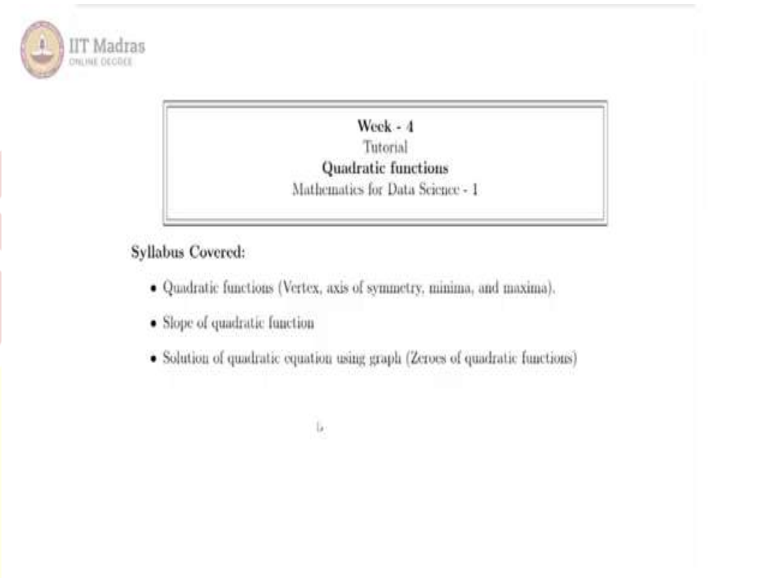

Hello mathematics students in this tutorial, we are going to look at problems related to the topics covered in weak four. And so, these are the topics and we will begin with our first question.

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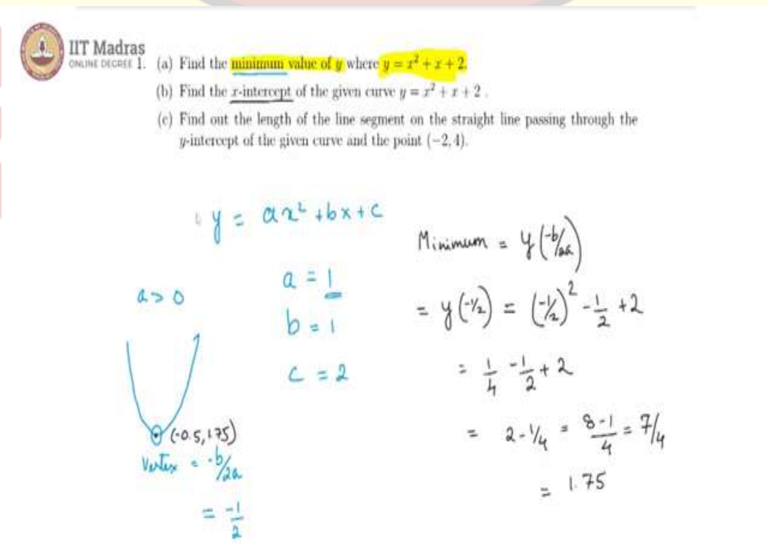

Here, we would like the minimum value of y for this particular quadratic function. And first, let us put down the quadratic function in its standard form, the standard form would be $y = ax^2 + bx + c$. In which case, our particular equation, the one that is given here would give us $a = 1, b = 1$ and $c = 2$. We are looking at the minimum value. Now, because the x square coefficient a is 1 that is a is greater than 0.

So, our parabola will be in this form, if a were lesser than 0, it would be inverted, it would be a downturned parabola, but right now it is in this form, and the minimum value is going to occur at this point, which is the vertex, which we know to be $\frac{-b}{2a}$. And so, we know our vertex for this particular equation is $\frac{-1}{2}$. And the value of y at $\frac{-1}{2}$ would be the minimum.

So, I can write the minimum is equal to $y\,(\frac{-b}{2a})$, which in this case is $y(\frac{-1}{2})$. And if I substitute that, I would get $(-\frac{1}{2})^2 - \frac{1}{2} + 2$, which is essentially $\frac{1}{4}$ - $\frac{1}{2} + 2$, which gives us 2 - $\frac{1}{4}$, which is equal to $\frac{(8-1)}{4}$, which is equal to $\frac{7}{4}$ and that is essentially 1.75. So, this point, here it is now we know it to be (-0.5, 1.75).

Now, they are asking us for the x- intercept and this is what we need to observe about the x −intercept.

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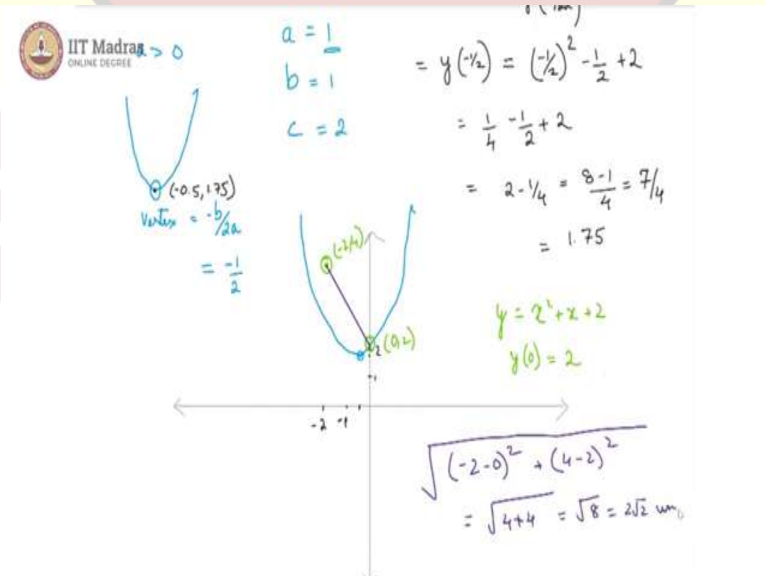

Point (-0.5, 1.75) assuming this is 1 and this is 2, this is -1 of course, so this is negative side and this is -2. So, -0.5 is going to be somewhere here and on the Y- axis, this would be 1 and this would be 2, 1.75 is somewhere here so our vertex point is here.

And from here, we know that this is an upward parabola, which is going to be something like this. And that means it never touches the X- axis at all. There is no x −intercept for this parabola.

And lastly, it is asked to find the length of the line segment on the straight line passing through the y- intercept of the given curve and the point (-2, 4). So, (-2, 4) is somewhere over here, and we need to find this point here the y −intercept. And the y −intercept is easy to obtain, since our curve is y = x^2 + x^2+ 2. $y-$ intercept is obtained when the curve cuts the Y- axis that is when $x = 0$ so $y(0) = 2$, therefore, our intercept is actually (0, 2).

And the point we are looking at is (-2, 4) and it is the length of this line segment that we require. And that line segment we will get by using the Euclidean distance formula, it will be $\sqrt{(-2-0)^2 + (4-2)^2}$ which is essentially $\sqrt{4+4}$, that is root $\sqrt{8}$, which is $2\sqrt{2}$, units.