IIT Madras

ONLINE DEGREE

Mathematics for Data Science 1
Indian Institute of Technology, Madras
Week 02 - Tutorial 04

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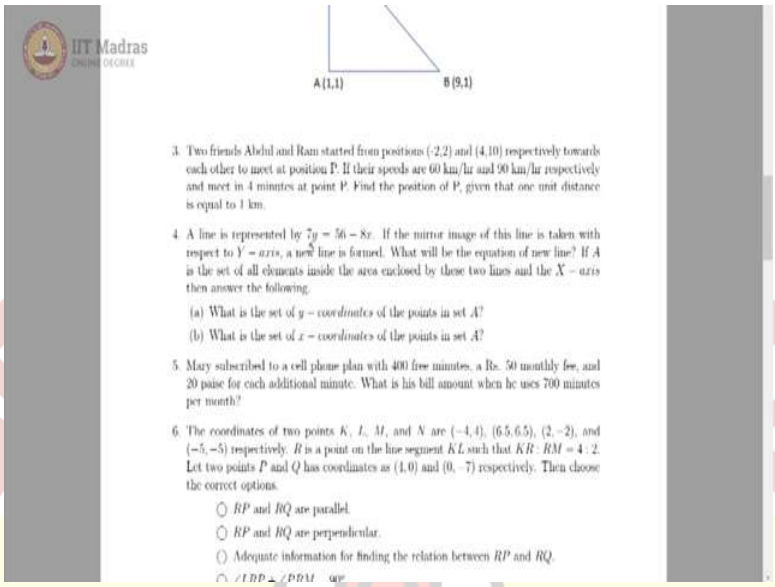

Now, fourth question, there is a line which is represented by 7y = 56 - 8x.

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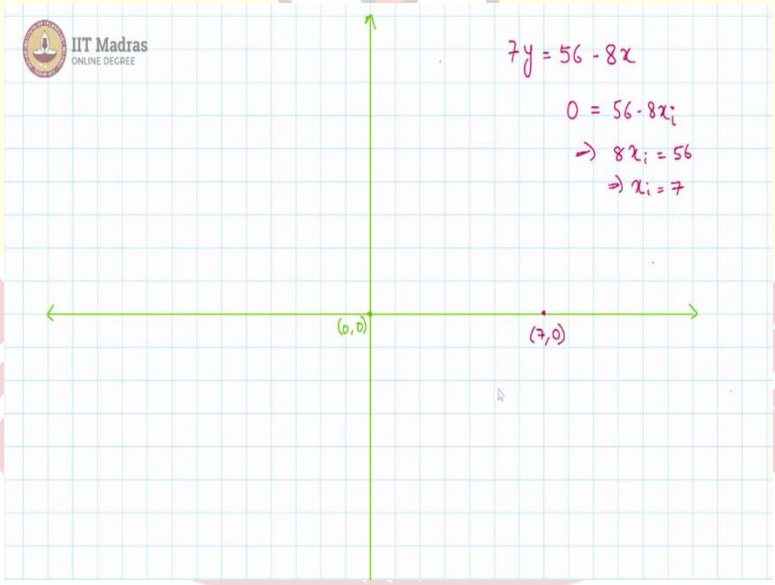

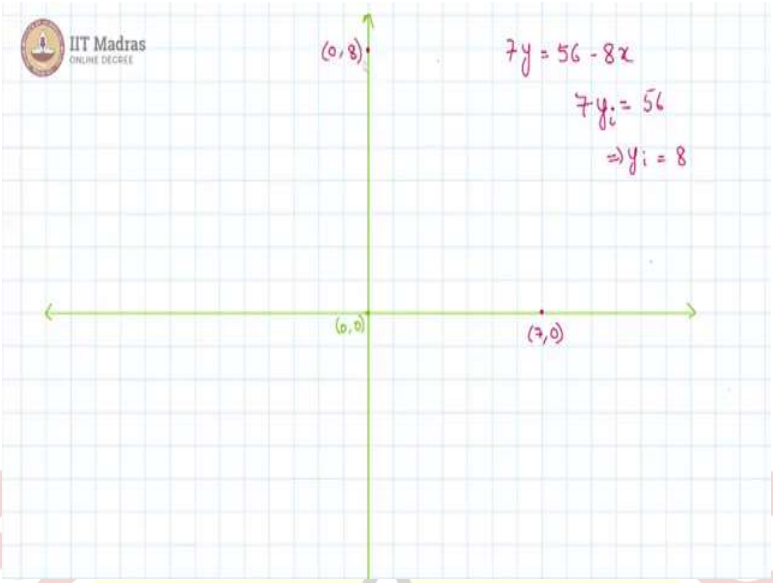

Let us first draw this line, so this is our origin and our line equation is 7y = 56 - 8x. In order to draw this line, in order to find out the curve, we need two points, two points are enough. And the easiest way to find out these two points is to work with the intercepts, that is when this line cuts the X-axis and when it cuts the Y-axis. So when, it is cutting the X-axis, y will be 0, so we just take the Y-coordinate to be 0, and we write 0 = 56 - 8x and to denote that this is the intercept, I am going to call it x_i and that gives us $8x_i$ = 56 and that gives us x_i= 7. So, the x- intercept is 7 which is here. So, (7,0) is one point. And now, for the other point, we take x to be 0 and thus we can say 7y is equal to 56. Again, for the intercept, I am going to use y_i, 56 - 0, therefore y_i, , the y intercept is 8. So, this point here, which is (0,8), this is our y-intercept.

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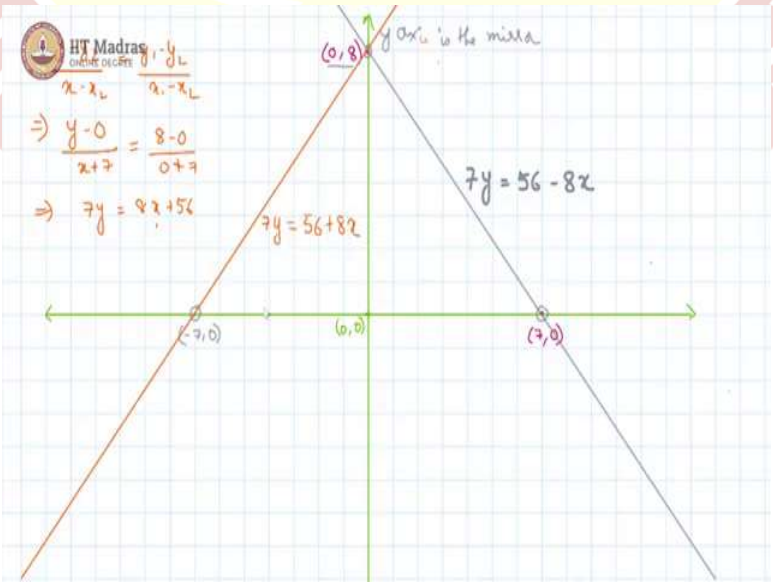

So, this is a straight line, we have been given 7 y = 56 - 8x. It passes through (7,0) and (0,8). Now, for a mirror image, what happens is, and here we are treating the Y-axis as the mirror, so Y-axis is the mirror, you are at the same distance from your mirror as your reflection. So, your reflection will be at the exact distance from the mirror on the opposite side as you, so for example, if we take our (0.7,0) on the other side, which is this point that is (-7,0), that would be the reflection of (7,0) with respect to the Y-axis as the mirror. However, (0,8), since it is already on the Y-axis, its reflection is going to coincide with itself, so this is the other point of the reflection.

And thus, the mirror image for this line is going to be this other line which passes through these two points, (-7,0) and (0,8). For finding the equation of this line, we can use the two point form. And when we apply the values, we get (y – 0) / (x +7) = (8 – 0) / (0 + 7), which gives us 7y = 8 x + 56. So, the mirror image line if you have to write it in the same form as the other one, 7y = 56 + 8 x.

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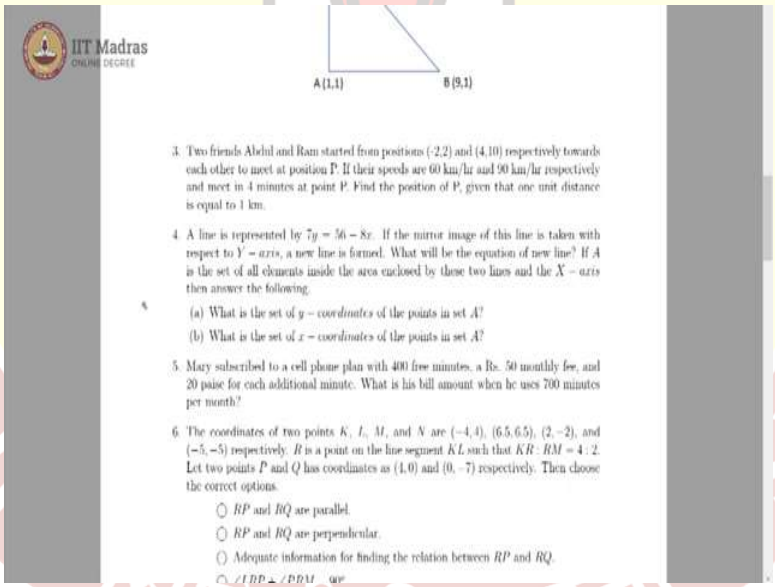

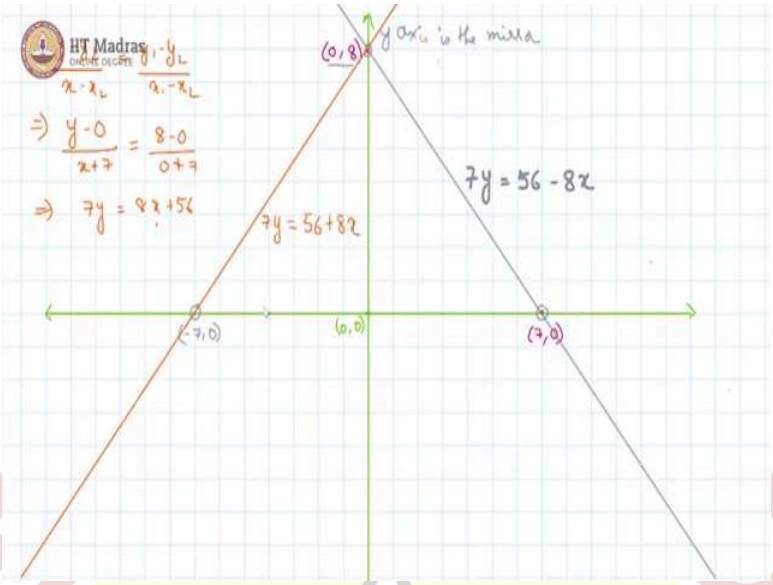

Now, in the next part of the question, they are asking if A is the set of all elements inside the area enclosed by these two lines and the X-axis. So, we are looking at this triangle, and in this triangle, we have being asked what is the set of Y coordinates of the points in set A.

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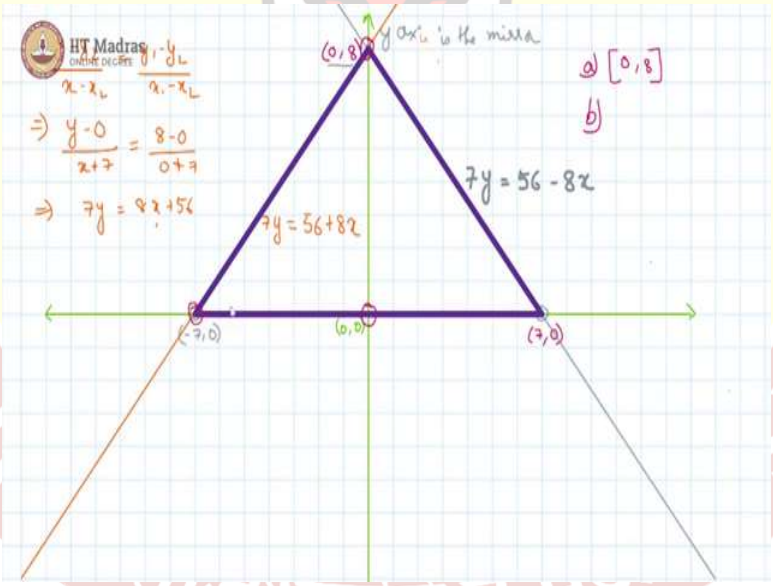

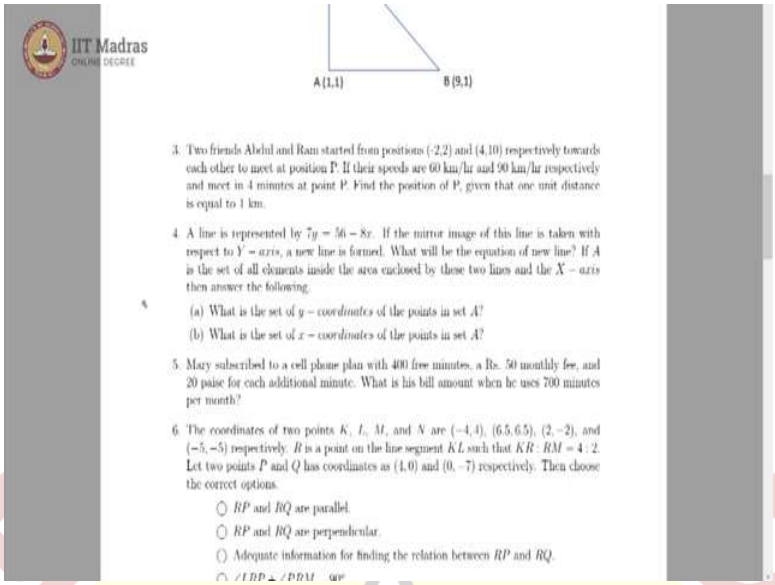

So, all possible Y coordinates in this set. So, every point within this triangle and on the triangle itself count, and as you can clearly see the least Y coordinate here is 0, and the maximum Y coordinate here is 8. So, the set of Y coordinates is going to be the closed interval [0, 8], because we are considering the triangle also to be part of this set, not just the points inside the triangle interior to the triangle, we are considering the triangle also to be part of the set. So, this is the answer for part A. And for part B we have what is the set of X coordinates of the points in set A, and again, we look for the least and the maximum here, the least is -7 and the maximum is 7. And every value in between is there so this would be again the closed interval [-7 ,7].