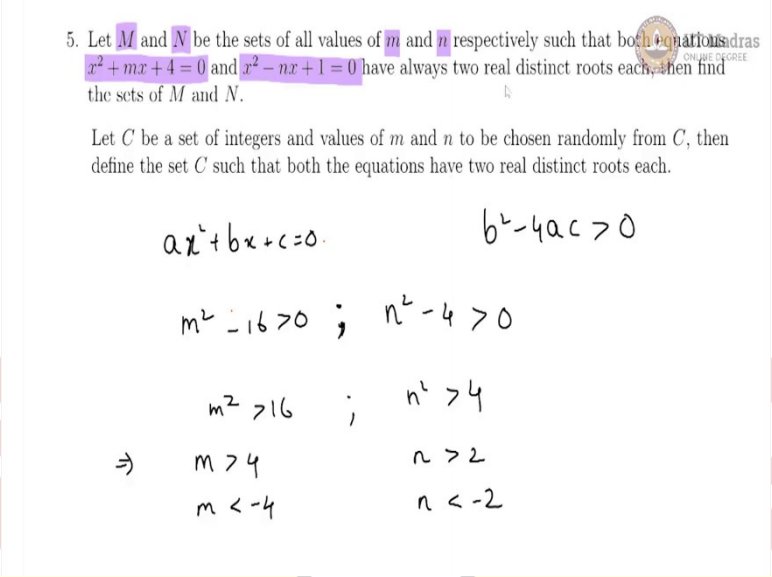
IIT Madras

ONLINE DEGREE

Mathematics for Data Science 1
Week 05 - Tutorial 05

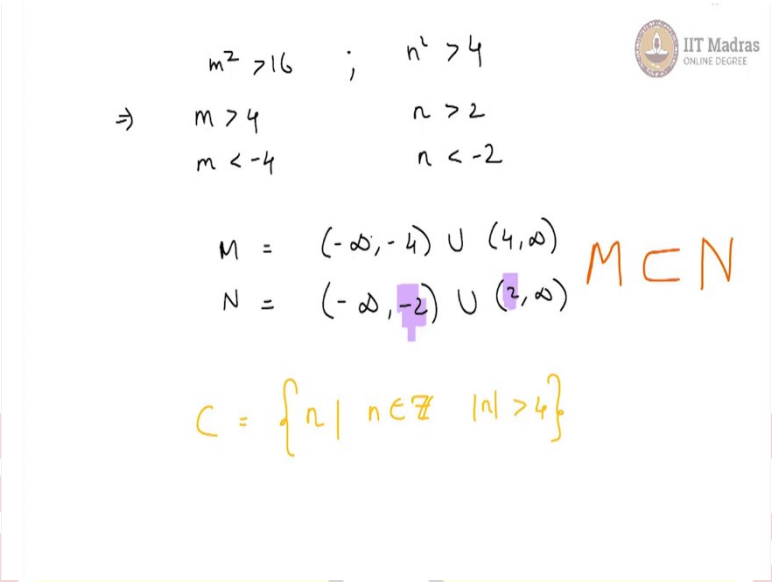
(Refer Slide Time: 0:14)



In this question we have 2 sets capital M and capital N which are sets of all values of small m and small n respectively such that these two equations have always two distinct real roots each, then find the sets M and N. Let us finish this part first. So, for a quadratic equation $ax^2 + bx + c = 0$ to have distinct real roots, the discriminant which is basically the value $b^2 - 4ac > 0$.

So, for this first equation that would be $m^2 - 16 > 0$ and simultaneously, we need for the second equation $n^2 - 4 > 0$. So, $m^2 > 16$ and $n^2 > 4$ and this would imply m is positive and greater than 4 or m is negative and lesser than -4. And here this would imply similarly n is positive and greater than 2 or n is negative and lesser than -2. So, these are all the possible values for which you will have two real distinct roots for these equations.

(Refer Slide Time: 2:02)



So, your set M would be the union of two intervals, one is a $(-\infty, -4) \cup (4, \infty)$. And set N is similarly $(-\infty, -2) \cup (2, \infty)$. Now the next part of the question, C is a set of integers and values of m and n are to be chosen randomly from C, then define the set C such that both equations have two distinct real roots each.

So, this is necessarily one single set we are taking and m and n should be chosen from that set. So, we clearly cannot have m being -2 or 2 or even -3 or 3. The set we are looking for is some sort of an intersection of capital M and capital N because both small m and small n should be drawn from this. And in this case that intersection will just be the set capital M because M is necessarily a subset of N.

However, C is also given out to be a set of integers, so it is not just the intersection of m and n, it is the set of integers which belong to the intersection and this case that intersection is only capital M where therefore, we have this set coming up as C.