IIT Madras

ONLINE DEGREE

Mathematics for Data Science 1
Week 07- Tutorial 04

(Refer Slide Time: 0:14)

4. A skydiver jumps out of a plane travelling at 3000 m above sea level. When she was about 500m above the sea level she opens her parachute. She dives into the sea and reaches 30 m deep in the sea. She then swims and reaches the sea coast from there she takes a helicopter and reaches her home as shown in the figure.
Note: The given figure is a rough diagram and answers should be based on the figure.

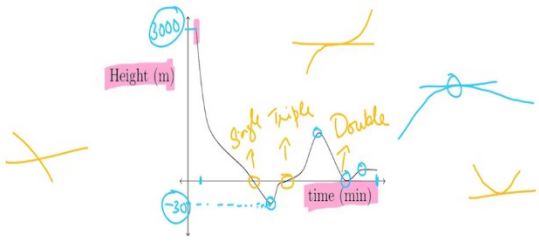

Figure T-7.2

- Range of the curve so formed is [-30m, 3000m].
- The domain of the curve will be the time taken for the entire journey.
- Number of turning points are 5
- The degree of the polynomial formed by the curve will be at least 6.

A skydiver jumps out of a plane travelling at 3000 meter above sea level. And when she was about 500 meter above the sea level, she opens a parachute. And then she dives into the sea and reaches 30-meter-deep into the sea. Then she swims and reaches a sea coast from there she takes a helicopter and reaches her home as shown in the figure.

So this figure is between the height and time there is no x coordinate in this. This is only about the y coordinate taking sea level to be 0 and the time. So initially she is way above sea level, so this point is going to be our 3000 because as where she is jumping from and then she is dropping quite quickly and then she slowly dropping after she opens a parachute. And she reaches under the sea so here it is negative till she goes to the point where it is - 30 meter below sea level.

And from there she swims out and she takes a helicopter and she goes. So we are supposed to see which of these option are correct and the range of the curve so formed is - 30 to 3000 which is true - 30 to 3000 is her total y coordinate range. And the domain of the curve will be the time taken for the entire journey that is true so your curve starts here when she jumps till the point she reaches home.

So this is correct this is also correct. Number of turning points are 5 so I see only 1, and 2, 3 turning points. So this is not maybe this is a turning point I am not able to say because it appears to go a

little like this and then bend down. So probably this is a turning point. But either way there are not 5 they are less than 5 so this is wrong. And then the degree of the polynomial formed by the curve will be at least 6.

Now we have to look at the roots here. So let us take this root this is a single root it just cuts the $x$axis like this, whereas this is a more, if the x axis like this, it is kind of touching it this way and that only happens if your root is a triple root at least. So it cannot happen for single root and it does not happen for any even powered root because for root which occurs even number of times you would not cut the x axis.

So this has to be at least a triple root. So this is a single root the first one is the single root this one we are assuming it is a triple root because they are asking for minimum degree at least so we are looking for what it what the number of roots is in the minimum. And here there is a root which occurs an even number of times because it is touching the x axis and turning around it is not actually crossing the x axis.

So this is at least a double root so we have one +3 +2. So we have at least 6 roots therefore the degree also has to be at least 6. So this is also correct.