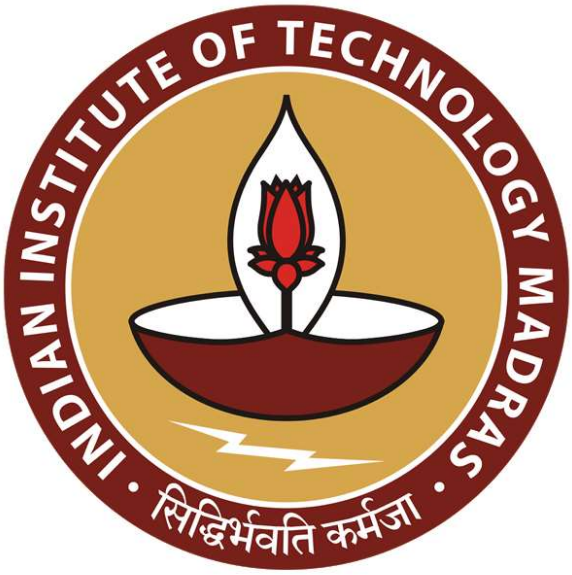


# IIT Madras

## ONLINE DEGREE

**Mathematics for Data Science 1**
**Professor. Neelesh S Upadhye**
**Department of Mathematics**
**Indian Institute of Technology, Madras**
**Week - 04**
**Tutorial - 02**

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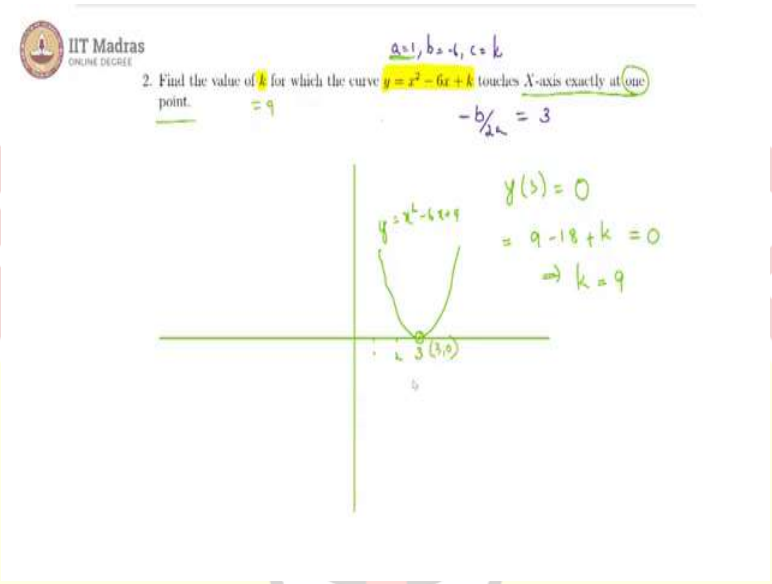


Now, second question we are going to have, this quadratic functions curve touches the X-axis exactly at 1 point. And for that what is the value of $k$ supposed to be? First observation should be that the vertex is given to us. The vertex, which is $\frac{-b}{2a}$, here $a = 1, b = -6$, and $c = k$, thus the vertex is $\frac{-b}{2a}$, which is $\frac{6}{2}$ that is 3. So, this is 1, this is 2 and this is 3, our vertex is on this particular line that is $x = 3$. And we are told that it touches the X- axis, the parabola touches the X-axis at precisely 1 point.

We also can see that a is positive, so this is an upward turn parabola, upturned parabola. And if it touches the X-axis at exactly 1 point that is only possible when the vertex is right here on the X-axis itself, and from here, our parabola looks something like this. That means, for this condition to be satisfied at the vertex, $y = 0$ that is $y(3) = 0$. And that is equal to $9 - 18 + k = 0$. This gives us $k = 9$ that is it so $k = 9$. When that happens, our equation is $y = x^2 - 6x + 9$ and it has its vertex at (3, 0).