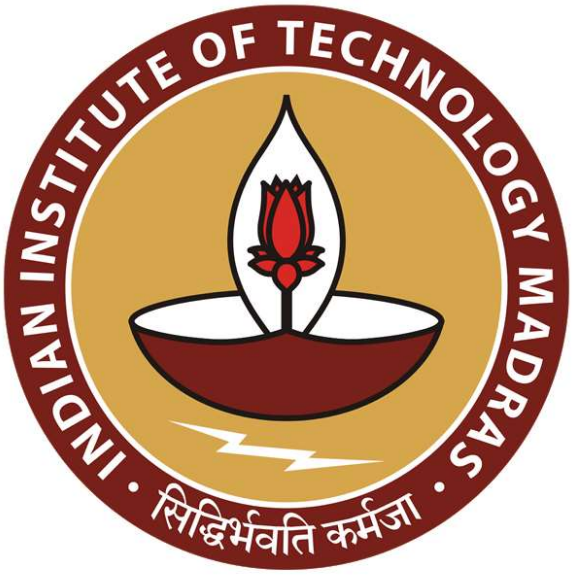
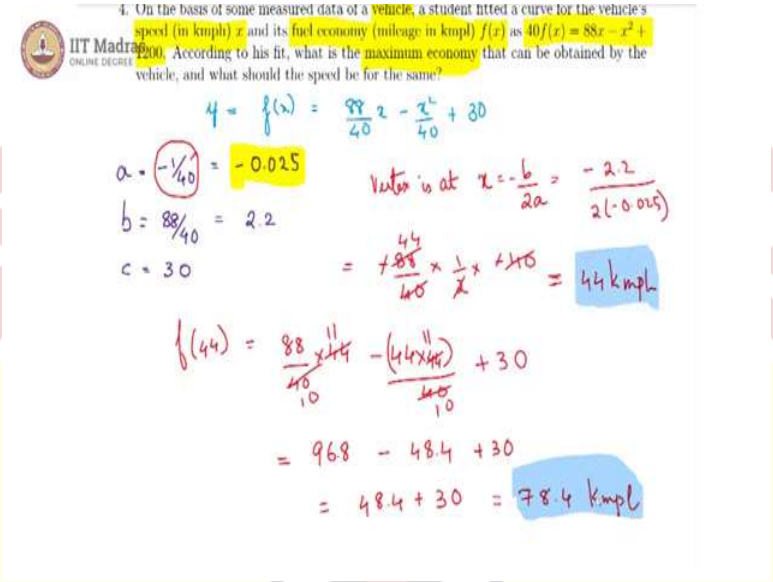


IIT Madras

ONLINE DEGREE

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

(Refer Slide Time: 00:15)



In the fourth question, there is some data of a vehicle, and a student fitted a curve for the vehicle's speed x. So, this is our variable x and its fuel economy mileage in kilometre per litre as $f(x)$. So, it is a function of x and this function is given in this way, we are going to use it for y which means if we reduce it to the standard form, we will get $y = f(x) = \frac{88}{40}x - \frac{x^2}{40} + 30$. So, we have the situation where a the coefficient of x square is $\frac{-1}{40}$, which is equal to -0.025. And b is the coefficient of x which is $\frac{88}{40}$ and that is $\frac{22}{10}$, therefore 2.2, and lastly, $c = 30$.

Now, we may observe that the x square coefficient is negative so this is a downturn parabola, which is why they are asking what is the maximum economy. So, at the vertex, you will get the maximum fuel economy so we need to find the vertex. And we know that the vertex is at x is equal to $\frac{-b}{2a}$, which in our case is then $\frac{-2.2}{2\times(-0.025)}$. This is probably better than in fractions.

So, if we write it down in fractions, we have $-b = \frac{88}{40}$ and this will be $\frac{1}{2}$ into $\frac{1}{2}$ and $\frac{1}{a}$ is then -40 itself, because a is $\frac{-1}{40}$. So, we have the 40 and the 40 cancelling off and minus and

minus become plus 2, and 88 will give us 44. So, we have the vertex that is we get the maximum fuel economy at a speed of 44 kilometres per hour. And what is the maximum economy at this particular speed that we can calculate from our equation directly we have $f(44) = \frac{88\times44}{40} - \frac{44\times44}{40} + 30$ so this is 4, 10s a 4, 11s.

This is also 4, 10s and 4, 11s and we get $96.8 - 48.4 + 30$, which is then further equal to 96.8 is two times 48.4 so you will get $48.4 + 30$ giving us 78.4 kilometre per litre. So, we can say that this is our maximum fuel economy which is achieved at this particular speed.