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SPEAKERS

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Here's another question, we've got a question with three parts. The first one says, find the values of X where which F of X is equal to zero. Well, that's pretty straightforward. We can rewrite this as zero is equal to E X minus 1, E X minus four. And if either one of these brackets is equal to zero, then F of X is going to be equal to zero. So we have X minus one is equal to zero, we can solve for X. We'd have E X is equal to one. Take, take the log of both sides, maybe you already see the answer. If we take the log of both sides, we end up with X is equal to log one or X is equal to zero. So if X is equal to zero, then F of X is also equal to zero. So that's one. The next one, what about this bracket right here? Maybe I should add one. So you know that we're working on question one here. I've got E X minus four equal to zero. Again, I could rewrite it like so E X is going to be equal, E to the X is equal to four, take logs of both sides, we take logs of both sides, the X comes down. And we have X is equal to log four, or X is equal to two log two if you prefer. I've just factored the four there and then applied the, applied the appropriate log rule.

And so this is the answer to part one. Now we're ready for part two. Part Two wants us to find the derivative of this. So what derivative rules are we going to need to use here? Well, looking at this, I think I'm going to use the product rule. And so I'm going to take the derivative of the first bracket and multiply it by the second plus the derivative of the second bracket, multiplied by the first bracket. And if I do that, I get F prime X, it's going to be equal to E X, E X minus four, plus E X, E X minus one. Now let me try and simplify this, I've got F prime X is equal to E X, E X minus four plus E X minus one. And continuing to simplify, we've got two E X minus five.

Now what about finding the limit of F of X as X approaches negative infinity? Well, we could think of E to the power of a very, very small number or a very large negative number, which is the equivalent. And if we did that we'd have, we'd have E to the negative infinity minus one, times E to the negative infinity minus four. And that would basically approach zero. So you can think of that as approaching zero, getting very close to zero. And if it got really close to zero, we're going to be left with zero minus one times zero minus four, which is equal to four. So as X gets smaller and smaller as we move from the right to the left, F of X approaches four in the limit.

Now one last question here, we might want to try and find the maximum value For this function, does it have an extreme point does it have an interior extreme point? Interior extreme point. And we can find that by setting F prime of X equal to zero. Now, E to the power of X can never be zero, now it can be zero in the limit as we go to negative infinity, but if we're using finite numbers, E to the X is always going to be a number greater than zero, might, it's going to be very, very small, very close to zero, but never be actually quite at zero as long as we're using real numbers. So if we want to get F of, F prime of X equal to zero, let's focus our attention on this bracket right here, this internal bracket. So what's it going to take to have two E X minus five equal to zero? Well, that's going to be like having E to the X is equal to five divided by two. And taking logs, we end up with X is equal to the log of five over two, or log five minus log two, if you prefer. Now we don't have a test to evaluate whether this extreme, well I should say whether this critical point, is a extreme value, or whether it's a local max or a min, we'll get into that in future videos. But one thing we can do is graph this function. And take a look at it and compare what we see on the graph to the answers that we came up with just now.

And when we do that, we see the following graph, we can see that there is some sort of interior, some sort of interior extreme value occurring when X is at this point here. That does kind of look like the log of five over two. And if I use a calculator, I get the log of five divided by two is equal to 0.916. And that looks pretty close, that X value there looks pretty close to 0.916. And it looks like, according to this graph, we've got a minimum. And remember, we looked at the limit as X approaches negative infinity. So we can be sure that this F of X here is going to be equal to four.

And looking here, knowing that this continues on that way, and this continues up, we don't see any, any maximum value, the function just keeps, it looks like it's just going to keep growing. But we do see a minimum here at this point that we found previously. Great job making it this far, we did some problems together, you found some extreme points, you found some critical points, we looked at some graphs. Hopefully the terminology is sticking in your head. Now going forward, we're going to look at some more mathematical tools to put into your toolbox. We're going to look at the first and second derivative test for a maximum and a minimum. And then after that, we'll look at local minimums and maximums, and then we can look at some inflection points and some other topics in optimization.