

Welcome to the third lecture. Paul lecture. Today we have before starting the lecture, let me review the laws of logarithm. The laws of logarithms, and after reviewing the laws of logic. We will solve some problems and demonstrate the use of these laws. In the last lecture we have already done so,

So here we will solve somewhat elementary problems, but later on we will pick up and we will solve some complicated problem. We have in the last class we have studied 4 laws of logarithms. First one was multiplication law. This law, if you are logarithm, is logged with the base  $a$  of the element  $2^M$  into and multiply. Then it actually converts it into a sum with respect to logarithm that is equal to  $\log$  to the base of plus  $\log$  to the base of this. Remember, all these operations are valid.  $0$  is not equal to  $1$  and  $M \& N$  are positive numbers. Positively. The next law is the question. Which suggests that if you have a division of two numbers and take  $\log$  of that those two numbers. Basically then it actually converts it into a subtraction that is locked with the base of  $b$ , which is equal to  $\log$  with the base  $B$  of minus  $\log$  with the base of this called coastal block or division law. It can be done on the Internet sometimes. Similarly, the first rule is called addition rule or multiplication. The word law comes. This is very pleasant. We have not yet demonstrated any use of this law. It is called change of base law. This will help you in simplifying many calculations. What does it do? It changes the base of the  $\log$ . For example,  $\log$  to the base scale of. If you want if you don't like the page change and you want to change the page change in order to simplify the calculations, then this law helps you. By saying this is equal to  $\log$  to the base of them upon  $\log BC$  of the where  $C$  also satisfies the standard conditions, that is  $C$  better than zero and  $C$  not equal to. This law, which we will demonstrate the use of this law in today's class and the last law, is power law, which is locked to the base of the power. Can be any number. It can be negative. Also it doesn't really satisfy the condition. You also and therefore lock the base area of raised to, is equal to North Times  $\log$  to the base of this called power  $\log$  or index lock. Whatever you want to call. More loss. Now we have some simple problems. More problems which are somewhat complicated and get the better idea of how to use the law. This first problem is. Expression. Anyways. This. But here. How to start? So we can. Which we have. This is our. Product what is it says? How to be base? With the base of. Long believes it is not equal to. All these conditions are satisfied. Reasons why. Very important. This multiplication law is with respect to the common base. If the bases are different and the expression that you cannot use. Could be possible. So you can use. Was not mentioned. Why use more? This this will play the role of. This one. This is not the debate period. Stop the debates. This is a fact. The debates of the human body. Which is. To face. Changed

So how this is? The debates. Going on. The decrease of. Amazing. How are you used to stop?  $4$  to  $6$ . Squared minus  $24$ . It's minus. Expressed by expand. This is why it is. We are solving problems which are based on problem. In order to see if the lawyer is, we need to. You say? Is positive or not? We cannot solve.

So let us take the argument. Why it is? Things. Minus  $5$  plus. If you have to. To speak. This will become  $60$ .

So it may appear that the law is not expression is valid for its is equal to. But we are not being given. Helping the universe. Which is. This is the form of the. It is not here to check your. This particular. If you are looking at this particular. Please. His wife was. This. Checking the post. The decrease. It's why it is  $366$  plus three and  $X1.6 - 3$ . The question is, is not defined for this particular number. Minus  $5 - 3$  really here, minus two. That means I have a dog. Basically by this. Just stopped. PSP. Now you see. If you are taking on some intermediate step.

So you have taken some intermediates and check whether the logarithm is needed or not. In this case you got  $16$ ,

So it may appear that information. It was this. Maybe maybe. The new what is the original form original form is given here.

So can you check in this form the not only the was not valid,

So the question asked was booked. This coming dismissed information is not working.

So I can check out. This is equal to minus. It's not the same. These small, small things can make a lot of difference when you're solving their problems and then check at some intermediate states. Click this and say that it seems  $616$  left hand side is equal to  $8 * 8$ . And you are making the mistake. This is not so. You have to go to the original expression, which is this. Whether you're talking to them is going to. This is hard to find. This is not different. Let us speak the case. The case. This is equal to. What is

that experience?  $6 + 3$ . Things like this. Wrong. Base. If I put this then I get the dogs of  $5 + 3$ . That's strong.  $5 - 3$ . We just building base.

So again, you want some multiplication. OK. The different sides. Checking whether your answer is correct or not,

So this is the correct answer. Therefore, the only answer that we have for this particular properties. That you could not verify anything. To verify this. We should not. From this particular from all, let us take another problem. This will teach you some. The number is. Observe the log. It will be a second problem. Sometimes sometimes. What is the problem? 6. I want to solve this. All this. I can take the dose containing logical to website. Pastries multiplication. But I will prefer to change this. Along the way you know something of this. From your. What is 1 equal? This we are doing from the. Dog. With the base full of boys. Longevity base. These for

So long. Stopped at the base. 1. If you agree with that, then again that rewrite. Right? Deepness What is the rest? Waiting. The case. With this also. By using the power lock, what will this be? All things. Because this is. Off to the base of the base of embracing. No. All the bases I've seen.

So I can use my. What did you do? Politics will be locked. Of. It's. Understand this this is long. It's good. What's 30? The next day? I want to eliminate these documents again. They will use the same project as chalk. Give me still. Pretty face. They must be equal. So this property. Equal to. I did not believe that we could have landed,

So now because of this what I have is. It's. A simple quadratic equation. This device you see. Square wireless. 6 minus beta. It's equal to. If you can do this, then what are what will be the factors. Athletes one is 11 is one point. And because the negative same is being. Express. Just get one.

So what would be my answer for it? Why this one? Now we will follow the same strategy we have to feedback these answers to our original expression, not any expression. We have nobody example this expression. Reading by the answer and feed the value of minus one, you will get the valid lot, but this is something that is not given to you. This you have converted

So you will put it back into this particular. This value of minus one, the original expression which is. And what do you get? The dog. Minus one. This particular rock is hardly minding. Very clear that we have not slightly. Just. This is not defined my case. This equal to minus one. Cannot be done. Equal to minus one is not. Solution. Only one which is X is equal to 11. My guess? Working you play some particular. Still a positive number. It will not create any problems,

So let us substitute this to this and verify the. That how we live. Stop. Sorry. This is 121. Equal to 1. Cities 1. Just stop.  $110 + 110$  Plus eleven 7121. Please. But this is nothing but of the form. Therefore I can use them. Center of the call. Sequel. One plus drop. This one. Did you base? Politics is equal. The answer is. It's. And you find your answer is very important.

So here we are. Now we will try to.

So that. Relationship. Question. Why? Alarm 6 see according to. It's. I want to give this relation is given to you. Then you need to solve that. It's on. That's why our politics. Quarter this is an interesting. First teaches us something. First you look at this expression. This is the problem that is. Once you get this expression. So. Express quality. Does that mean? Things. Because. We are dealing with all of the expressed like we are always dealing with all of the following things into way

So you know your way is not about.

So using this observation, if you look at the right hand side of this expression, then you will get something which is very nice. That's what I need to do. Is a quantity which is without locks,

So somehow I have to do some calculations

So that the dogs are eliminated.

So what I want in my case is why need some quantity? Of some experience. Some experts. Is equal to log out some other expressions. This is what? If I assume that you will be able to do something about this.

So let's try to do it. You can use the. Multiplication. .6. See. Here I have some friends. Are the base is not important yet? Only thing we need to know is the base is a common place. These are some questions we generally know that other pieces are common basis.

So if I do this. And therefore. This one point 2 is creating a problem for me.

So what I will do is I will quit this one by two. You say you like me. This particular resource types. It's +5. It's like a bond seems. See. Please.

So what does that mean? It's close. 16 square will be 26. See. It's.

So I have a deal with the bomb.

So we can use our standard. This. Can you please? Also. 536 You see for two things. This is the case. It does not take that we are on the right. What do you want? Something of this things? Why upon things can I get this? We are on the right by expand this while the entire XY or do some manipulation. Then I will get ya exactly. Trying to do. Exist exist? That's the voice. This. Two weeks. This 36 to the operator. On the right, the right hand side had some. Actually get the number 34 by doing some simple manipulation which is  $X^2 + 1$  square.  $36 - 234$ . That's why. Solve the problem because I can divide this. Before they get this. Split. Voice. Mornings. This should be the expression on the left hand side of our two,

So identity.

So if you take the individual just the first time, they will fix. Plus second. \*\*\*\* pics this is what we desired in the. It's. Inspired by by. Recipe yes, we wanted what we got here. There is no cross checking because you have been given an expression and you have to show that you can show that. What is your problem? The question is. Facebook. What is? This particular. You are given that please. Always. Is important to see. Do you want to show that? Now I need to validate. But this dog has many locks. I know that.

So many laws for their getting lost.

So what are the goals that I can have? Well, first, if you look at this. Use the political. Something like. Something. Use my power. Some expression. Someone that is. Work with this and that there is a possibility of getting this thing.

So this will be our strategy.

So let us take this and start. Yes it is. Which is equal to. To the discourse and play the multiplication of the product which is equal to. And I have half over. Facebook. Yes. After using multiplication rule once. It would be equal to. This player is 4/4. Squad is equal to.

So I used the first part.

So you can write this. This past. See. Square. But I don't like this because then I cannot handle many things.

So I want to eliminate the square root. Then what you're gonna do is just square both the sides. See. 16 closer desired expression and desired expression.

So the next step will be just wait for this it will be square. Because. This is. Is equal to 16. I got the expressions in space. The 61,000 website files. I started with this. Simplified the expression to such an extent that I respect. Reverse the steps to start with this. The talks. We will try to see what is the ordinary or what is the actual value of what can range of the values. What's the longest? Buddy got one.

So that is the question. According to the.

So what I will do in order to close this inequality? First we try to. Is just. Wait? Of life. Both of them will work on similar heights. Teams we have already had. Visible, but this is 2 by 3. What this one can be? According to our communities. You want to pull this off. This one will be. Basically, but I want since I want to compare this with three steps. Wait? And I got banned. I have to do some. To the base. Is it? What? I know something about this. I know the power low quality socks. Ladies. I know something about. What do I do? What is the property of less than? We have already seen that the law is. This. The 1st 100 is less than 120. More of the wrong, better be smaller. Julio similarly. Setting base. I'm just repeating this. Please spell of four. What is fire? What is equivalent to saying 25 squared which is attachment log? 625 this property of law. 625 this. This must be. This is true. There is also. Two by three less than. The problem is. Multiple. You'll notice there is no way. You can choose any ways. But she said that you are asked to is independent of the base,

So you cannot choose a place which simplifies it. Through this research.

So there are two ways to do this. One is you start with the left hand side and prove that this is equal to the right hand side or you start either right hand side through that. This is equal to the. You need to find. Division. 41427 You need to find somebody in DC numbers like 375 or seven,

So this may be different for us.

So instead of that we can start in the right hand side and try to solve this problem. Colleges, colleges. Secret. There is a blister of base base. Why this?

So now if I want to be so, this is equal to the difference I need to use multiplication. Because. I need to use power log. I need to use my application. Introduce postal code by distributors of success or anything.

So so first step. The numbers that are. Blog. All the powers. Where's the dog? Squared minus log 3. Find this. Similar. Then we will use the multiplication along and coastal cloud together and say that this is equal to dog. Square. Is this important to? What will this be equal to?  $\pi$  Square is 2525, into 2 is 150. OK sorry sorry.

So you just go into 25. This is. This should be equal to log off. 40 million in .3 is literally achieved by 147. 329 is 27. Say what?

So we are through that

So that they have hooked up with numbers. Continue the current number system. Twice. Cities solve points. That is given to. Dogs. Sport. Talk to the place. Now, if you notice, this problem is slightly different as it has places which are different. The music sport or other the basis.

So we have to be little bit careful handling these problems, and in such problems state of this property comes to our health.

So if you will notice more and 4000 specific relations, that is 2 squared is equal to four or four raise to half is equal to 2. If we are using change of pace property then we have to exploit this relationship to the proper manner to change our base property says that if you have. Log to the base speed of being in. It can be replaced blog to someday see how being upon God to some days. See this same here.

So how will I say how will these properties help? I want to make the basis of these two logs seem

So I will just make this this particular expression on the right hand side.

So let us make the oranges this equal to log base two of its lines.

So this also can be written as log base four days too fast by using this relationship or minus 3. Now the interesting part comes. I can use the change of base property. I am using because I want to change this place to the baseboard. Song. Could you please? It's minus 3. Also might do something easy. Do something please. Now the interesting part is again, choose to see because these arbitrary.

So to simplify calculations I can change this. The same change will appear here. This CEO if the same change appears here, then the problem becomes very simple. You already know by power law the denominator is half times log base four of four. Is that also you know?

So this is phase four.

So that was this year this course because this will be one and this will be

So you will get the right hand side to be equal to two files. Log to the base four  $X - 3$ .

Still I cannot use use my logarithm equality because this too is appearing

So I can simplify this as  $X - 3^2$ . What is my images? Because I have been given an equation, reduces equal to RHS,

So log the base 4 of  $X - 1$  is minus.

So if I write this here it is log to the base four of its minus. What? This simplifies the entire drama. Then we can always write this. Circles depend only if because the previous are same, it's minus one is equal to  $X - 3$  the whole square. No, it's just very easy problem because you have a quarterly which is it's minus one is equal to  $X^2 - 6X$  plus one. You guys easily simplify this

So that this is equal to  $X, ^2$ . It's a square. Wireless was. Correct? I praise this very easily, which is equal to  $6 - 5$ . To explain this. If that is the case. This is equal to  $\pi^3$ . The possible solutions to this problem? What do we need to do is because we are solving an equation which involves logarithms. We have to check if we substitute the values within the year positive whether the year positive or human or not.

So that is what we will do.

So let us take case one. This one is equal to. And it gives the dog to let us take the right hand side  $X - 3$  which will give you log of  $2 - 1$ .

So log of some base 450 base minus one exactly. And this is equal to this.  $6 - 3$ . Would you please? This is again equal. It's  $5 - 3$ , but it pays 3 of 31. Therefore existing

equal to five satisfies the equation is equal to five. Is the only possible solution of this problem? To summarize today's lesson, what we have done is today we have

demonstrated the use of logarithms and use of laws of logarithms. Based on the elementary problems that are associated with this logarithms. In the next class we will again do the same thing, but we will take intermediate level problems and solve those problems.

Increasing level of difficulty. I don't know. Again, demonstrate the same use of laws of

logarithms.

So we will end for today's session. See you in the next class.

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