

## **Influence Multiplication, Substitution and Factors Friends Against Function Limits Algebra Class XI**

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**Abstract:** This research aim for test influence mastery multiplication between tribe, concept factor friends, and substitution direct to determination function limit value with use factor companions and substitutes direct. Method used is analysis simple linear regression with hypothesis that has been formulated. Analysis results show that there is influence significant between mastery multiplication between tribe, concept factor friends, and substitution direct to determination function limit value. The stated hypothesis exists influence mastery multiplication between tribe, concept factor friends, and substitution direct to determination function limit value accepted based on results analysis simple linear regression. Next, analyze multiple linear regression show that mastery multiplication between tribe, concept factor friends, and substitution direct in a way together is also influential significant to determination function limit value. In conclusion, the novelty of this study is disclose outlook just the previous one Not yet revealed about influence mastery multiplication between tribe, concept factor friends, and substitution direct. Highlighting approach new in determine function limit value through multiplication factor companions and substitutes direct. This study in a way special conducted in class XI Science at SMA Negeri 20 Palembang, giving relevant findings and implications with context education local. Research result This support hypothesis that mastery multiplication between tribe, concept factor friends, and substitution direct own influence to determination function limit value with use factor companions and substitutes direct.

**Keywords:** Friend Factors, Function Limits, Multiplication

### **A. Introduction**

Mathematics own role important as waiter knowledge and as source knowledge for discipline other (Sulistiani & Masrukan, 2016). Mastery material mathematics is crucial thing in the learning process, and learning mathematics is something that form growth and change in self-individual. Understanding and mastery material at level basics are very influential to level of understanding continued.

Function limits algebra is draft important in mathematics makes it possible we for understand behavior function moment approach to something mark certain (Mukarromah, 2019) . However, understanding about function limits algebra often becomes challenge for student. A number of related concepts, such as mastery multiplication between tribe, concept factor friends, and substitution straight away, yes influence understanding student about function limits algebra.

One of material taught at school intermediate on is the limit of the function algebra. However, many students experience difficulty in understand concepts that become base in determine function limit value, such as multiplication between term, factor friends, and substitution direct. Therefore, that's important for increase mastery student to concepts that's for them can overcome difficulty in finish about function limits algebra.

Factor key in success learning mathematics is method of teacher teaching and the use of supporting media (Ridha Sabrina, Fauzi, 2017) . Teachers need notice conditions and needs student in understand draft beginning material (Fauzi & Suryadi, 2020) , because mastery draft the beginning is very important in finish about function limits with factor companions and substitutes direct. Students also experience it difficulty because lack of understanding to concepts previously. Study previously shows that approach active learning and focusing on concepts they can increase understanding students. However, not yet there is research that is special investigate influence mastery multiplication between tribe, concept factor friends, and substitution direct to understanding and application of function limits algebra in student's class XI.

Mastery multiplication between good tribe can make it easier determination function limit value with factor companions and substitutes direct. Draft factor friends can used for simplify function and make it easier limit calculation. Substitution direct is effective technique for determine function limit value with replace variable in function with close value limit point. The difference with research that I do is that research that I do will in a way special research influence mastery multiplication between tribe, concept factor friends, and substitution direct to determination function limit value in class XI Science at SMA Negeri 20 Palembang. I will dig in a way deeper in context class it and produce it findings new specific for situation education locally at SMA Negeri 20 Palembang.

This study aims for test influence mastery multiplication between tribe, concept factor friends, and substitution direct to determination function limit value with factor companions and substitutes directly in class XI Science at SMA Negeri 20 Palembang. This study will reveal how much its significance influence mastery concepts the to determination function limit value. Based on background behind the researcher interested for do study with title Influence Mastery Multiplication Between Tribe, Concept Factor Friends, and Substitutions Direct to Determination of

## Function Limit Values with Multiplying Factor Companions and Substitutions Directly in Class XI Science at SMA Negeri 20 Palembang.

The research entitled Influence Mastery Multiplication Between Tribe, Concept Factor Friends, and Substitutions Direct to Determination of Function Limit Values through Multiplication Factor Companions and Substitutions Directly in Class XI Science at SMA Negeri 20 Palembang is expected give a number of contribution following: 1) Improvement understanding students: this research can give more understanding student about mastery multiplication between tribe, concept factor friends, and substitution direct in determination function limit value. This matter can help increase skills and confidence self-student in understand and apply the concepts; 2) Improvement method teaching: findings from this study can give input valuable for internal teachers develop method effective teaching for teach mastery multiplication between tribe, concept factor friends, and substitution direct in context determination function limit value. Teachers can use findings the for designing more approach interactive, involving student in a way active, and giving relevant examples in learning; 3) Refinement curriculum: this research results can give input for development curriculum mathematics at the level school. Curriculum can be updated with enter more emphasis strong in mastery multiplication between tribe, concept factor friends, and substitution direct in context determination function limit value.

Mastery multiplication between tribe, concept factor friends, and substitution direct is component important in understand concept of function limits at levels school intermediate on. Ability student in control multiplication between tribe, concept factor friends, and substitution direct in a way direct influential to ability they in determine function limit value. This study aims for identify and analyze influence direct from mastery multiplication between tribe, concept factor friends, and substitution direct to ability student in determine function limit value. This study carried out in Class XI Science at SMA Negeri 20 Palembang with involve students in data collection and analysis. This research result expected can give more understanding about influencing factors mastery the concept of function limits and gives input for repair learning in the field. This research own relevance important in increase learning function limits at high school level and helping student in control draft the in a way more.

This matter can help student prepare self with Better For face challenge more math complex at a higher level tall. Contribution to study next: this research can also be done give donation knowledge new in field mathematics and education. Findings obtained can become base for study more further involving other influencing factors mastery multiplication between tribe, concept factor friends, and substitution direct in function limit context. So, this research expected give benefit direct to students,

teachers, curriculum, as well give contribution to development knowledge in the field mathematics and education.

## **B. Methods**

Type study is study correlational for analyze cause and effect between ability student in finish questions multiplication between term (X1), concept factor friend (X2), substitution direct (X3), and determination function limit value with multiply factor companions and substitutes straight (Y). Population his Entire student class XI Science at SMA Negeri 20 Palembang 2012/2013 teaching, with a total of 166 students. Sample chosen in a way random from population, with use method draw without Pay attention to strata. Sample consists of 85 students from class XI IPA2 and XI IPA4.

Instrument Study is test written shaped essay referring to the plan implementation learning and syllabus class XI Science at SMA Negeri 20 Palembang. There are 20 questions divided to in four variables (X1, X2, X3, Y), with score maximum 100. Data collected through test written shaped given essay to student class XI Science at SMA Negeri 20 Palembang. Test the covers mastery operation multiplication between tribe, operation draft factor friends, surgery substitution direct, and decisive function limit value with multiply factor companions and substitutes direct.

In this research, the data analysis used was several tests based on classical assumptions. According to Gudono (2011) classical assumption diagnosis consists of linearity test, multicollinearity test, auto correlation test and heteroscedasticity test. According to Sunyoto (2011) in the classic test explain that tests assumptions the classic consists from linearity test, multicollinearity test, auto correlation test and heteroscedasticity test.

Linearity test use approach ANOVA table in SPSS version 20 program. Multicollinearity test use statistics Pearson product moment correlation. Autocorrelation test using the Durbin-Watson test. Heteroscedasticity test involve calculation absolute residual value and correlation between variables and absolute residuals. Analysis model in this study use multiple linear regression for analyze influence variables X1, X2, and X3 against variable Y. Multiple linear regression model used is:  $\hat{Y} = a + b_1X_1 + b_2X_2 + b_3X_3$ .

## **C. Results and Discussion**

Research result about mastery multiplication between tribe, mastery draft factor friend, substitute direct to determination function limit values for student's class XI Science at SMA Negeri 20 Palembang. Research result shared become three part big, that is description variables, results condition analysis, and results testing

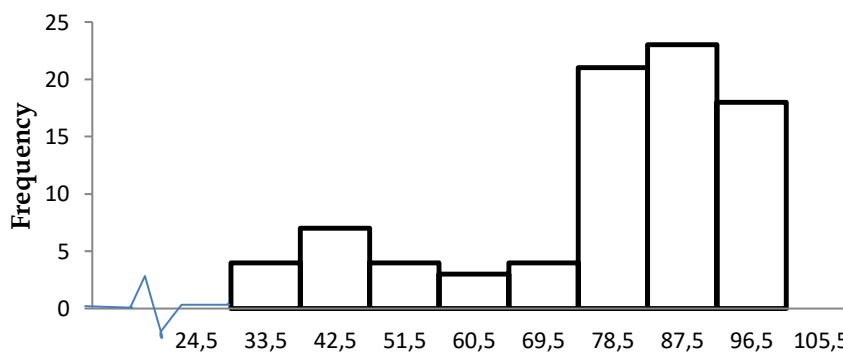
hypothesis. First part explains characteristics of each variable with use table distribution frequency, histogram, average value, and standard deviation.

Second part load results analysis requirements, meanwhile part third load results testing hypothesis. Description variable mastery multiplication between tribe in this part describe mastery multiplication between ethnic group student class XI Science at SMA Negeri 20 Palembang. Table 1 shows distribution frequency mark test student along with average and standard values deviation.

**Table 1. Distribution Frequency Multiplication between Ethnic group**

Mark	$f$	$x_i$	$fx_i$	$x_i^2$	$fx_i^2$
34--42	4	38	152	1444	5776
43--51	7	47	329	2209	15463
52--60	4	56	224	3136	12544
61--69	3	65	195	4225	12475
70-78	4	74	296	5476	21904
79--87	22	83	1826	6889	151558
88--96	23	92	2116	8464	194672
97--105	18	101	1818	10201	183618
<b>Amount</b>	<b>85</b>		<b>6956</b>		<b>598210</b>

Figure 1 shows a histogram of values test mastery multiplication between ethnic group.

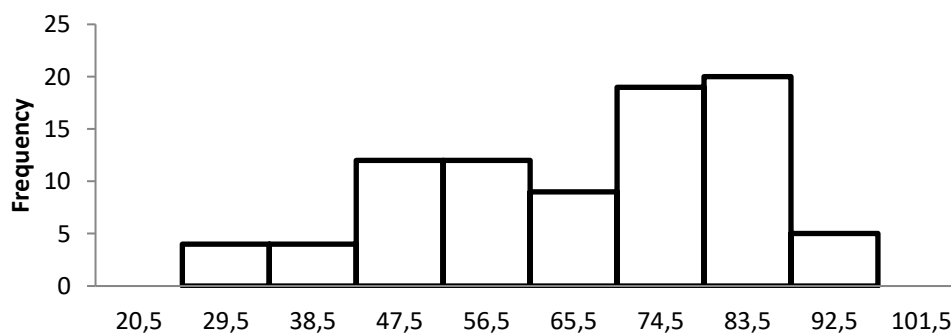


**Figure 1. Histogram of Student Test Scores for Multiplication Material between Tribes**

Analysis results show that average mastery value multiplication between ethnic group is 81,32 and standard deviation is 19,47. Mastery draft factor friends, this part explain mastery draft factor friend's student class XI Science at SMA Negeri 20 Palembang. Table 2 shows distribution frequency mark test student along with average and standard values deviation.

**Table 2. Distribution Test Score Frequency Mastery Draft factor Friends**

Mark	$f$	$x_i$	$fx_i$	$x_i^2$	$fx_i^2$
30--38	4	34	136	1156	4624
39--47	4	43	172	1849	7396
48--56	12	52	624	2704	32448
57--65	12	61	732	3721	44652
66--74	9	70	630	4900	44100
75--83	19	79	1501	6241	118579
84--92	20	88	1760	7744	154880
93--101	5	97	485	9409	47045
<b>Amount</b>	<b>85</b>		<b>6040</b>		<b>453724</b>



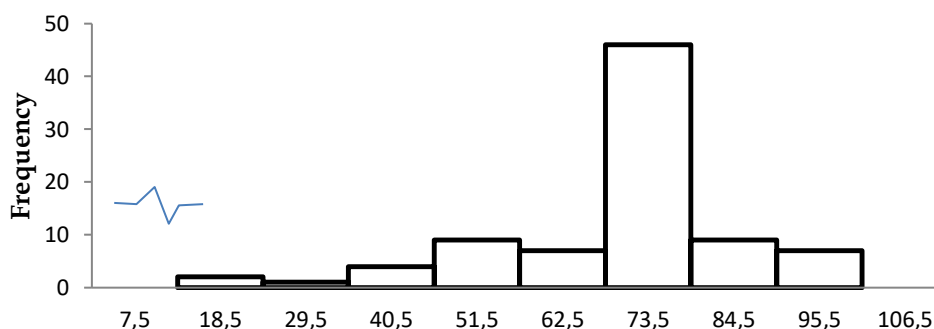
**Figure 2. Histogram Student Test Scores Mate on the Friend Factor Concept**

Analysis results show that average mastery value draft factor friends are 71,05 and standard deviation is 16,98. Mastery substitution direct, explain about mastery student in finish question substitution direct. Table 4.3 distribution frequency and Figure 3 histograms were used for show distribution mark test students.

**Table 3. Distribution Frequency Substitution Direct**

Mark	$f$	$x_i$	$fx_i$	$x_i^2$	$fx_i^2$
19--29	2	24	48	576	1152
30--40	1	35	35	1225	1225
41--51	4	92	368	8464	33856
52--62	9	57	513	3249	29241
63--73	7	68	476	4624	32368
74--84	46	79	3634	6241	287086

85--95	9	90	810	8100	72900
96--106	7	101	707	10201	71407
<b>Amount</b>	<b>85</b>		<b>6591</b>		<b>529235</b>

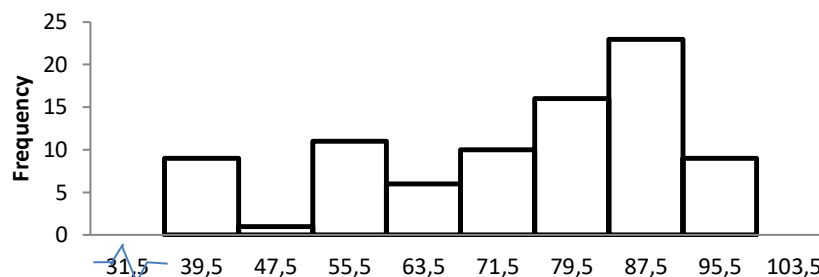


**Figure 3.** Histogram of Student Test Scores for Direct Substitution Material

Average mastery score substitution direct is 77,54 with standard deviation amounting to 14,61. The final part, mastery of function limits algebra, discussing about mastery student in concept of function limits algebra. Like previously, there was table 4 distribution frequency and image 4 histograms for visualize distribution mark test student.

**Table 4.** Distribution Frequency Limit Function Algebra

Mark	$f$	$x_i$	$fx_i$	$x_i^2$	$fx_i^2$
40--47	9	43.5	391.5	1892.25	17030.25
48--55	1	51.5	51.5	2652.25	2652.25
56--63	11	59.5	654.5	3540.25	38942.75
64--71	6	67.5	405	4556.25	27337.5
72--79	10	75.5	755	5700.25	57002.5
80--87	16	83.5	1336	6972.25	111556
88--95	23	91.5	2104.5	8372.25	192561.8
96--103	9	99.5	895.5	9900.25	89102.25
<b>Amount</b>	<b>85</b>		<b>6593.5</b>		<b>536185.3</b>



**Figure 4.** Histogram of Student Test Scores on Algebra Function Limits

Average value of mastery of function limits algebra is 77,57 with standard deviation of 17,05. On this research, done analysis to influence mastery multiplication between tribe, concept factor friends, and substitution direct to determination function limit value with multiply factor friends at SMA Negeri 20 Palembang. Research result show exists significant influence from third factor the to determination function limit value. Mastery multiplication between ethnic group own influence to determination function limit value with multiply factor friends. In finish limit questions with multiply factor friends, students need control multiplication between tribe, fine ethnic one group nor binomial.

Multiplication between ethnic group the required for multiply every ethnic group in the limit questions. Next, do it calculation statistics simple linear regression for test influence mastery multiplication between ethnic group to determination function limit value with multiply factor friends. Analysis results show exists coefficient a is 44,533655 and coefficient b is 0,38651938. With so, every increase by 1 score unit mastery multiplication between ethnic group will followed increase score determination function limit value with multiply factor friends amounting to 0,38651938 units.

Next, do it testing hypothesis simultaneous for prove influence mastery draft factor friends to determination function limit value with multiply factor friends. Analysis results show that there is significant influence, with mark count F amounting to 15,514617 which exceeds mark count F of 3.94. Therefore, that's a hypothesis null ( $H_0$ ) is rejected and the hypothesis alternative ( $H_a$ ) is accepted. Next, do it discussion about influence mastery draft factor friends to determination function limit value with multiply factor friends.

Draft factor friends used in rationalize form fraction in solution about limits. Research result show exists significant influence from mastery draft factor friends to determination function limit value with multiply factor friends. The calculation results statistics simple linear regression show exists coefficient a is 39,651146 and coefficient b is 0,545321. Every increase by 1 score unit mastery draft factor friends will followed increase score determination function limit value with multiply factor

friends amounting to 0,545321 units. Testing hypothesis simultaneous show exists significant influence from mastery draft factor friends to determination function limit value with multiply factor friends, with calculated F value.

These findings show that mastery multiplication between tribe, concept factor friends, and substitution direct contribute in a way positive to understanding student about function limits algebra. Students are given priority learning concepts own more abilities more in apply function limits algebra in context problem real. Study kind has lots carried out by researchers previously. The method research used is also varied variety in accordance type location respective research.

Following relevant research that is as following (Novalisa, 2020) in His study explain that results Study mathematics taught students with method make a match more influential than taught with method mind mapping learning. Equality in this study is on variables bound. Difference in study This is on variables free. (Khasanah, 2022) His study explained that there is influence positive in use approach realistic mathematics education to ability base multiplication eye lesson mathematics student class VIII SMP Negeri 2 Kertanegara, Regency Purbalingga. This matter explained based on results research that states that approach realistic mathematics education can become bridge for student for easier in understand something material mathematics. Equality this study is lies in the variables free, meanwhile difference it's on variables bound. Nur & Sugiatno (2018) research entitled development ability communication mathematical student in function limit material through approach science in high school, conclusion in this study is first, the data collection tool used in this study is question test start and test end.

Second, learning and teaching mathematics is activity social activities involving at least two parties, namely teachers and students. Even though the mathematical communication skills important, however in fact learning mathematics during this still not enough give attention to development ability. Condition like this no far different if compared to with studies the researcher's introduction do when discuss student experience difficulty if present results his job in front of class matter this showing that the student's mathematical communication skills not yet develop.

For overcome matter teachers should use this approach proper learning in embed concepts and provide skills to student for look for solution strategies problem with the right way, one of them with the scientific approach. Instruments research used is mathematical communication skills test which includes aspect language mathematics, tables, and graphs. Coefficient reliability calculated test with deep Cronbach's Alpha study it's 0,48 with thereby can said that test used in study this is reliable with category currently.

Results and discussion of research results for explain how influence development ability communication mathematics students with level ability (upper, medium, lower) after they given the learning process mathematics in function limit material algebra use approach scientific, then required data presentation. To know which group experienced it significant difference so must the test carried out is the mean withney test. Based on between group top and group and group there is also below difference mathematical communication skills development. Meanwhile on the test final, score average tests at each level ability taller from score average test initially. By overall, if the gain is obtained from level ability beginning and end that treatment form giving learning mathematics use scientific approach produce the average mathematical communication skills of students is also different.

Difference this influenced by ability base mathematics student in finish algorithm and is also influenced by the environment study student for example student there is follow guidance study outside school hours. Then after given learning with shorthand scientific obtained results test end development of student's mathematical communication skills in function limit material algebra obtained score average tests at each level ability taller from score average test initially.

By general exists enhancement results study for each level ability form development of student's mathematical communication skills. Equality in study this lies in the variables free substitution direct and variable bound namely the limit of the function algebra, whereas difference his questions used in study including to in the question is not routine. Ferdiawan & Gandung (2015) research entitled Analysis Error Connection Mathematical Students on Function Limits Material Algebra in Class XI IPA 2 MAN 1 Palu, Conclusion in study this is Error connection mathematical For category error hook facts and concepts in finish about function limits algebra carried out by the subject capable medium and subject capable low. Effect negative from view this is lots students who feel difficulty with mathematics before they learn mathematics.

Material in learning mathematics own linkages between one unit with another unit, because that student must understand concept that has been studied so that student can understand draft furthermore. Students who have ability high connection capable hook material or concept that has been studied previously in finish something question. Error student in do question be one instruction to know mastery material mathematics students. By Because that's it, it is error student in finish something question need analyzed and searched factor what that's the only thing that influences it then searching for solution the solution. Completion process something questions or solution something question is application from a number of concepts and properties that have been studied.

Learning material mathematics each other related so that in the learning process, material one math become material precondition for other materials, or one concept required for explain other concepts. Based on results interview obtained that mistake made student related with understanding concept and application concepts on new material. A number of students Already capable apply and relate concept that has been studied.

Based on opinion a number of expert can concluded miscellaneous type mistakes made student in finish question mathematics as following: 1) error draft is error in understand idea abstract; 2) error count is error count in operation mathematics; 3) error translation is error change information to a mathematical model or error in give meaning something sentence mathematics; 4) error procedure is related error with steps solution questions; 5) errors sign is error in give or write sign or notation mathematics; 6) strategy errors are error occurred if student choose a path that doesn't right direction to road dead end; 7) error systematic is related error with wrong choice of top technique extrapolation; 8) error fact is related errors with material in the question; and 9) errors principle is error because he misunderstood principle or apply principles in the problem.

(Surnyadewi & Ismailmuza, nd) in this research result show that application of learning models cooperative talking stick type can increase results learn function limits student class XI Science 2 SMA Negeri 6 Palu follow phases, namely: 1) convey goals and prepare students, teacher conveys apperception and purpose learning; 2) present information, the teacher motivates and explains utility stick as well as inform material learning; 3) organizing student in groups learning, the teacher shapes group; 4) helpful work group, the teacher gives help as necessary; 5) evaluate, the teacher gives stick then give questions and students answer as well as make conclusion; 6) provide confession or appreciation, the teacher gives award. Achievement objective learning mathematics can see from results study mathematics.

Learning outcomes expected math is results study Aachieved mathematics completeness study. Based on statement that, then need exists study special to learning mathematics from all party education to achieve it objective learning and changing view student to mathematics. Information obtained from a mathematics teacher at SMA Negeri 6 Palu is student difficulty in learning mathematics especially the function limits and learning process in the material This Still felt Far from expected reality. So, based on answer student are known that student does not can use correct limit concept, so result the limit value obtained is incorrect. Based on teacher' information and answers results test for identify problem, then mistakes made student because not yet understand draft in determine function limit value algebra. Nurman (2014), in his research title determine characteristic features specific method solving function limits algebra on shapes not of course own conclusion

limits explained mark something function on certain input values with results from closest input value. In general, there are two forms function limit equation frequent algebra used, namely the limit of the function variable algebra approach marks particular and the second form is the limit of the function variable algebra approach not infinite.

Method substitution used for look for function limit value algebra is not contained form not of course. Whereas for form not of course can resolved with method share it with rank supreme and form not of course is solved with method multiply it moreover formerly with factor his friend. Rule L'Hopital is method last to get it used for obtain mark the limit if method substitution, factoring, multiplication friends, or distribution with rank highest no can done. Rule L'Hopital is something rule in finish problem of limits for value the limit there, with method lower limited function then substitute limit point that has been determined. Because of the shapes not of course own different way in the solution with forms of course you can do substitution direct for get mark the limit. The concept of the limit of the function in question is about mark something function, method sketching chart functions, substitution, factoring, and numbers friends. Equality in study this using third element variable free and variable bound multiplication between tribe, the concept of friend factor and substitution direct in determination function limit value.

Researchers also make assumptions that part big interest and motivation study mathematics student low, attention student to learning less, student inclined feel fed up to learning and students inclined passive in the learning process as well as ability student in understand material still not enough. Dependency student still tall to the presence of the teacher, the consequences of the learning process taking place one direction and students still doubtful and afraid convey opinion nor question to the teacher. Reality this cause low results Study mathematics student.

Based on matter the expected with use something help tool objects familiar with life student that is sticks and instruments music can to make student no feel fed up in the learning process. Madonna (2013) with conclusion study is problems that cause difficulties for students for solve the function limit is they No control material prerequisites mentioned above. However, students still not yet know method use table for look for limit value, because they not yet understand how use table for get their limit value search for, because the limit is in a point there is if value in direction left limit and right limit the same. Research conducted by Kulsum (2020) also identified the difficulties identified by researchers in the field are substantiated with results diagnostic tests, which found that student sometimes no understand how apply the concept of left limit and right limit in function limit problems algebra, sometimes also includes mark to in given function for get value, where matter this is error general made by students in finish problem. Equality study this is with using

variable free the concept of peer factors and variables bound his with using the limit function algebra.

Tinangon & Sudarman (2019) conclusion study this is classroom action research, research this held in two cycles. Other information obtained, namely student not enough involved active in the learning process and only capable students tall only the brave for ask and answer question from the teacher. In the learning process, methods are often used by teachers' method lecture, because this method no need complicated and easy preparation for done. Related with problem the for-reach objective increase results study students on function limits material algebra specifically determine the limit of the function algebra approach something point and determine the limit of the function algebra approach not finite, researcher apply something possible approach direct student finite can work active in learning, that is with apply approach process skills.

Based on description above, researcher apply something possible approach direct student finite can work active in learning, that is with apply approach process skills. Involvement student in the learning process with itself give experience and encouragement to students in carry out the learning process. A number of implementing research approach process skills in the learning process prove that approach this can increase skills procedural in finish question so that result results Study student increase. Every student said complete if obtain score  $\geq 75$  (criterion minimum completeness in MAN 2 Palu), (2) occurs enhancement results study students in cycle II after follow learning in cycle I with use approach process skills, (3) success of the learning process determined by success researcher in carry out the learning process with approach process skills.

This matter signifies that student not yet understand material precondition so that need given more apperception in depth learning done. At the meeting first researcher apply approach process and meeting skills second that is researcher give test end action to student. This study own implications important in repair learning mathematics in class XI. Approach is recommended active, involving learning discussion group, solving problems, and activities practical application mastery multiplication between tribe, concept factor friends, and substitution direct applied in a way wide for increase understanding student about function limits algebra.

#### **D. Conclusions**

Based on the previous description, it can be concluded that Based on results research that has been described in chapter before , yes concluded as follows, 1) There is influence positive mastery of multiplication between terms in determining the limit value of a function by multiplying by equal factors and direct substitution in class XI Science at SMA Negeri 20 Palembang; 2) There influence positive mastery of the

friend factor concept in determining the limit value of a function by multiplying the friend factor in class XI Science at SMA Negeri 20 Palembang; 3) There is a positive influence mastery of substitution directly to determine the limit value of a function by multiplying the friend factor in class XI Science at SMA Negeri 20 Palembang; and 4) There is influence positive mastery of multiplication between tribes, the concept of the friend factor and direct substitution in determining the limit value of a function by multiplying the friend factor in class XI IPA SMA Negeri 20 Palembang. Mastery multiplication between tribe, concept factor friends, and substitution direct own significant influence to understanding and application of function limits algebra in student's class XI. Prioritizing learning concepts this in a way effective increase understanding student about function limits algebra. Approach active and involved learning discussion group, solving problems, and activities practical can used for optimizing mastery multiplication between tribe, concept factor friends, and substitution directly to students. Expected findings this can give input for development curriculum mathematics at the level school intermediate and improving quality learning mathematics in a way whole.

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