SEMESTER LEARNING PLAN

LINEAR ALGEBRA I COURSES
(23H01110403)

TEACHING TEAM

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STUDI PROGRAM OF MATHEMATICS - S1
FACULTY OF MATHEMATICS AND NATURAL SCIENCES
HASANUDDIN UNIVERSITY
MAKASSAR
2025

STUDY PROGRAM OF MATEMATIKA - S1
FACULTY OF MATHEMATICS AND NATURAL SCIENCES
HASANUDDIN UNIVERSITY

Vision

The scientific vision is to become a study program with an international reputation in the development of mathematics based on the Indonesian maritime continent by 2030

Vision Strategy

Misson

To fulfill the above vision, the Undergraduate Mathematics Study Program has four missions, namely:

- Organizing innovative and effective mathematics learning to improve the quality and creativity of students in order to compete nationally and internationally.
- Improving a research culture that produces internationally reputable publications.
- Playing an active role in community service activities and collaborating with other academic institutions, government, business, media and society.
- Carry out governance in the Mathematics Study Program that is effective, efficient and transparent based on IT and ISO 9001:2015 standards to achieve the tridharma goals.

Graduate Profiles

Gagal diterjemahkan

PLO charged to courses

CPL-1 (ILO 1) - Students are able to demonstrate an advanced understanding of basic pure and simple applied mathematics.

CPL-2 (P2) - The students are able to identify objects, techniques, and theorems in fundamental mathematics, and making a connection for solving problems

CPL-3 (KU1) - The students are able to analyse a mathematical problem with logic, analytic, and systematic structure

CPL-7 (KK3) - The students are able to demonstrate mathematical skills which include interpretation, connecting problems, solving problems, and communicating individually or teamwork

Course Learning Outcomes (CLO)

CPMK-1: Students have a relatively deep understanding of linear algebra concepts. (CPL1)

CPMK-2: Students have good abilities in calculating linear algebra problems. (CPL2)

CPMK-3: Students are able to apply linear algebra concepts (CPL3 dan CPL7)

Sub-CLO

Sub CPMK-1: Understand the objectives of the course and its relationship with other courses. Able to define matrices and complete matrix operations (CPMK-1)

Sub CPMK-2: Apply Elementary Line Operations to solve systems of linear equations that have been interpreted in multiplication matrix notation Ax=b. Be able to define the echelon form (reduced echelon form) of a matrix and provide examples (CPMK-1 dan CPMK-2)

Sub CPMK-3: Able to determine the determinant of a square matrix by finding cofactors and minors then using the row and column expansion method. Able to find the inverse of a nonsingular matrix using an adjoint matrix and find a single solution to a system of linear equations using Cramer's rule (CPMK-1, CPMK-2 dan CPMK-3)

Sub CPMK-4: Be able to determine the conditions necessary so that the solution of the homogeneous linear equation, (A-(lambda)I)x = 0, has a non-zero solution based on |A(lambda)I|. (CPMK-2)

Sub CPMK-5: Apply Elementary Row Operations to find the determinant of a quadratic matrix and the inverse of a non-singular matrix (CPMK-2 dan CPMK-3)

Sub CPMK-6: Able to complete computations in n-dimensional Euclidean space. Know the definition of linear transformation in Euclidean space. (CPMK-2 dan CPMK-3)

Sub CPMK-8: Able to define a structured set (equipped with binary operators) as an example of a vector space (sub) or not (sub) vector space. (CPMK-1)

Sub CPMK-9: Able to determine linearly mutually exclusive sets and linearly non-mutually exclusive sets in vector space. Able to determine linear freedom by determining a single or unilateral solution for a system of homogeneous linear equations. Able to determine mutually exclusive sets linearly in more than one way (CPMK-1 dan CPMK-3)

Sub CPMK-10: Able to determine the basis of vector spaces, especially the solution space for homogeneous linear equation systems. Able to determine the dimensions of a vector space. Able to determine the coordinate vector relative to the base. (CPMK-2 dan CPMK-3)

Sub CPMK-11: Able to express the relationship between the main spaces of a matrix: row space, column space, and null space. Able to determine base and dimensions using Elementary Line Operations. (CPMK-1 dan CPMK-2)

Sub CPMK-12: Be able to state that vector space is an inner product space. Be able to define the inner product of the inner product space. (CPMK-1 dan CPMK-3)

Sub CPMK-7: Apply the concept of linear transformation to Euclidean space in matrix language, functional language, or geometric language (reflection, projection, rotation, dilation, contraction). Able to determine eigenvalues and eigenvectors of linear operators. (CPMK-3)

Learning Analytics

Linear Algebra I

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Be able to state that vector space is an inner product space. Be able to define the inner product of the inner product space. (CPMK-1 dan CPMK-3)

↑

Able to express the relationship between the main spaces of a matrix: row space, column space, and null space. Able to determine base and dimensions using Elementary Line Operations. (CPMK-1 dan CPMK-2)

↑

Able to determine the basis of vector spaces, especially the solution space for homogeneous linear equation systems. Able to determine the dimensions of a vector space. Able to determine the coordinate vector relative to the base. (CPMK-2 dan CPMK-3)

↑

Able to determine linearly mutually exclusive sets and linearly non-mutually exclusive sets in vector space. Able to determine linear freedom by determining a single or unilateral solution for a system of homogeneous linear equations. Able to determine mutually exclusive sets linearly in more than one way (CPMK-3 dan CPMK-1)

↑

Able to define a structured set (equipped with binary operators) as an example of a vector space (sub) or not (sub) vector space. (CPMK-1)

↑

Apply the concept of linear transformation to Euclidean space in matrix language, functional language, or geometric language (reflection, projection, rotation, dilation, contraction). Able to determine eigenvalues and eigenvectors of linear operators. (CPMK-3)

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Able to complete computations in n-dimensional Euclidean space. Know the definition of linear transformation in Euclidean space. (CPMK-2 dan CPMK-3)

↑

Apply Elementary Row Operations to find the determinant of a quadratic matrix and the inverse of a non-singular matrix (CPMK-2 dan CPMK-3)

↑

Be able to determine the conditions necessary so that the solution of the homogeneous linear equation, (A-(lambda)I)x = 0, has a non-zero solution based on |A(lambda)I|. (CPMK-2)

↑

Able to determine the determinant of a square matrix by finding cofactors and minors then using the row and column expansion method. Able to find the inverse of a nonsingular matrix using an adjoint matrix and find a single solution to a system of linear equations using Cramer's rule (CPMK-1, CPMK-2 dan CPMK-3)

↑

Apply Elementary Line Operations to solve systems of linear equations that have been interpreted in multiplication matrix notation Ax=b. Be able to define the echelon form (reduced echelon form) of a matrix and provide examples (CPMK-1 dan CPMK-2)

↑

Understand the objectives of the course and its relationship with other courses. Able to define matrices and complete matrix operations (CPMK-1)

Have passed the course Mathematical Logic and Sets and Basic Mathematics II

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STUDY PROGRAM OF MATHEMATICS - S1
SEMESTER LEARNING PLAN

Course	Code	Cource Group	Credits	SEMESTER	Compilation Date
Linear Algebra I	23H01110403	Algebra	1	2	10 Agustus 2024

AUTHORITY	SLP Developer Lecturer	Coordinator	Head of Study Program
	Dra. Nur Erawati, M.Si.	Prof. Dr. Amir Kamal Amir, M.Sc.	Dr. Firman, S.Si.,M.Si.

SLOs that are imposed on the course	
SLO-1:	Mahasiswa memiliki pemahaman yang relatif mendalam dalam matematika murni dan matematika terapan sederhana.
SLO-2:	Mahasiswa mampu mengidentifikasi objek, teknik, dan sifat dalam matematika dasar, dan membuat koneksi untuk menyelesaikan masalah
SLO-3:	Mahasiswa mampu menganalisis suatu masalah matematika dengan logika, analitik, dan struktur sistematis
SLO-7:	Mahasiswa dapat menunjukkan keterampilan matematika termasuk menghubungkan masalah, menyelesaikan masalah, interpretasi, dan berkomunikasi secara individu atau dengan kerja tim
SLO ⇒ Course Learning Outcomes	
After completing this course, it is expected:	
SLO-1	**CLO-1:** Students have a relatively deep understanding of linear algebra concepts.
SLO-2	**CLO-2:** Students have good abilities in calculating linear algebra problems.
SLO-7	**CLO-3:** Students are able to apply linear algebra concepts
SLO-3	**CLO-3:** Students are able to apply linear algebra concepts
CLO ⇒ Sub-CLO	
CLO-1	**Sub-CLO-1:**Understand the objectives of the course and its relationship with other courses. Able to define matrices and complete matrix operations
	Sub-CLO-2: Apply Elementary Line Operations to solve systems of linear equations that have been interpreted in multiplication matrix notation Ax=b. Be able to define the echelon form (reduced echelon form) of a matrix and provide examples
	Sub-CLO-3: Able to determine the determinant of a square matrix by finding cofactors and minors then using the row and column expansion method. Able to find the inverse of a nonsingular matrix using an adjoint matrix and find a single solution to a system of linear equations using Cramer's rule
	Sub-CLO-8: Able to define a structured set (equipped with binary operators) as an example of a vector space (sub) or not (sub) vector space.

Learning Outcomes Course		**Sub-CLO-9:**Able to determine linearly mutually exclusive sets and linearly non-mutually exclusive sets in vector space. Able to determine linear freedom by determining a single or unilateral solution for a system of homogeneous linear equations. Able to determine mutually exclusive sets linearly in more than one way
		Sub-CLO-11: Able to express the relationship between the main spaces of a matrix: row space, column space, and null space. Able to determine base and dimensions using Elementary Line Operations.
		Sub-CLO-12: Be able to state that vector space is an inner product space. Be able to define the inner product of the inner product space.
	CLO-2	**Sub-CLO-2:**Apply Elementary Line Operations to solve systems of linear equations that have been interpreted in multiplication matrix notation Ax=b. Be able to define the echelon form (reduced echelon form) of a matrix and provide examples
		Sub-CLO-3: Able to determine the determinant of a square matrix by finding cofactors and minors then using the row and column expansion method. Able to find the inverse of a nonsingular matrix using an adjoint matrix and find a single solution to a system of linear equations using Cramer's rule
		Sub-CLO-4: Be able to determine the conditions necessary so that the solution of the homogeneous linear equation, (A-(lambda)I)x = 0, has a non-zero solution based on |A(lambda)I|.
		Sub-CLO-5: Apply Elementary Row Operations to find the determinant of a quadratic matrix and the inverse of a non-singular matrix
		Sub-CLO-6: Able to complete computations in n-dimensional Euclidean space. Know the definition of linear transformation in Euclidean space.
		Sub-CLO-10: Able to determine the basis of vector spaces, especially the solution space for homogeneous linear equation systems. Able to determine the dimensions of a vector space. Able to determine the coordinate vector relative to the base.
		Sub-CLO-11: Able to express the relationship between the main spaces of a matrix: row space, column space, and null space. Able to determine base and dimensions using Elementary Line Operations.
	CLO-3	**Sub-CLO-3:**Able to determine the determinant of a square matrix by finding cofactors and minors then using the row and column expansion method. Able to find the inverse of a nonsingular matrix using an adjoint matrix and find a single solution to a system of linear equations using Cramer's rule
		Sub-CLO-5: Apply Elementary Row Operations to find the determinant of a quadratic matrix and the inverse of a non-singular matrix
		Sub-CLO-6: Able to complete computations in n-dimensional Euclidean space. Know the definition of linear transformation in Euclidean space.
		Sub-CLO-9: Able to determine linearly mutually exclusive sets and linearly non-mutually exclusive sets in vector space. Able to determine linear freedom by determining a single or unilateral solution for a system of homogeneous linear equations. Able to determine mutually exclusive sets linearly in more than one way
		Sub-CLO-10: Able to determine the basis of vector spaces, especially the solution space for homogeneous linear equation systems. Able to determine the dimensions of a vector space. Able to determine the coordinate vector relative to the base.
		Sub-CLO-12: Be able to state that vector space is an inner product space. Be able to define the inner product of the inner product space.
		Sub-CLO-7: Apply the concept of linear transformation to Euclidean space in matrix language, functional language, or geometric language (reflection, projection, rotation, dilation, contraction). Able to determine eigenvalues and eigenvectors of linear operators.
	Correlation between SLOs/CLOs to Sub-CLOs	

SLOs that are charged on the Course	CPMK	SUB CPMK	Form of Assessment*						Weight	Value	Student Score
			Formative	Sumative							
				Quiz	Independent Assignment	Written Exam	Presentation	Written Exam			
SLO-2	CLO-2	SUB-CLO-4		15	0	0	0	0	15		
SLO-7	CLO-3	SUB-CLO-6		0	15	0	0	0	15		
SLO-7	CLO-3	SUB-CLO-7		0	0	20	0	0	20		
SLO-1	CLO-1	SUB-CLO-8	Presentations are assessed based on the oral presentation rubric (attachment)	0	15	0	0	0	15		
SLO-7	CLO-3	SUB-CLO-10		0	15	0	0	0	15		
SLO-2	CLO-2	SUB-CLO-11	Presentations are assessed based on the oral presentation rubric (attachment)	0	0	0	5	0	5		
SLO-7	CLO-3	SUB-CLO-12		0	0	0	0	15	15		
				15	45	20	5	15	100		

Course Description	This course focuses on Matrices, Systems of Linear Equations, Vector Spaces and Vector Subspaces, Linear Transformations, Eigen Values, Eigen Vectors, Base, Inner Multiplication Space
Learning Materials/Subjects	1. Matrices and Systems of Linear Equations 2. Determinants 3. Euclidean Spaces and Linear Transformation. 4. Vector Spaces, Basis, and Dimension (Vector Spaces, Basis, and Dimension). 5. Eigen values and Eigen vectors. 6. Inner Product Spaces.
	Main References

Reference	Howard Anton, Chris Rorres, 2019. Elementary Linear Algebra, Applications Version, 12th Edition, John Wiley & Sons. Nur Erawaty, 2023. Basic Properties of Vector Spaces. Unhas Press.
	Additional References
	Seymour Lipschutz, Marc L. Lipson, 2009. Schaum's Outline of Linear Algebra, 4th edition, McGraw-Hill
Teaching Team	Prof. Dr. Amir Kamal Amir, M.Sc., Jusmawati Massalesse, S.Si.,M.Si., Dra. Nur Erawati, M.Si.
Course requirement	Mathematical Logic and Sets, Basic Mathematics II

Week	**Sub CPMK (End-of-stage learning ability)**	**Penilaian (*Assesment*)**		**Learning Forms and Methods [time estimate]**		**Content**	**Weight of Assessment (%)**
		Indicator	**Techniques & Criteria**	**Offline**	**Online**		
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	Understand the objectives of the course and its relationship with other courses. Able to define matrices and complete matrix operations (CPMK-1)	**Formative:** Presence, activeness of students. **Sumative:** The accuracy of defining the matrix and usage skills matrix operations	**Formative Criteria:** Formative: Activeness in discussions is assessed based on the class participation rubric dinilai dengan rubrik 04 **Sumative Criteria:** **Assessment Technique:** Gagal diterjemahkan			Matrix and Matrix Operations	0

2	Apply Elementary Line Operations to solve systems of linear equations that have been interpreted in multiplication matrix notation Ax=b. Be able to define the echelon form (reduced echelon form) of a matrix and provide examples (CPMK-1, CPMK-2)	**Formative:** Gagal diterjemahkan **Sumative:** Accuracy in selecting and work through the Elimination stage Gauss (-Jordan) to search solution of Ax=b. Ability determine system solutions linear equations and expressed as a matrix and vector. Accuracy of use basic line operations become echelon form (echelon form reduced) from a matrix.	**Formative Criteria:** Formative: Activeness in discussions is assessed based on the class participation rubric (Appendix 1) dinilai dengan rubrik 01 **Sumative Criteria:** **Assessment Technique:** Test			System of Equations Linear and Shape Matrix Echelon	0
3	Able to determine the determinant of a square matrix by finding cofactors and minors then using the row and column expansion method. Able to find the inverse of a nonsingular matrix using an adjoint matrix and find a single solution to a system of linear equations using Cramer's rule (CPMK-1, CPMK-2, CPMK-3)	**Formative:** Students' attendance and activity. **Sumative:** Accuracy of calculation matrix determinant with more of one way, prove existence, looking for the inverse matrix uses matrices adjoint. Accuracy determines solution of systems of linear equations using Cramer's rule.	**Formative Criteria:** Presentations are assessed based on the oral presentation rubric dinilai dengan rubrik 02 **Sumative Criteria:** **Assessment Technique:** Test and Non-Test			Determinants and Inverse Matrix	0

4	Be able to determine the conditions necessary so that the solution of the homogeneous linear equation, (A-(lambda)I)x = 0, has a non-zero solution based on |A(lambda)I|. (CPMK-2)	**Formative:** Gagal diterjemahkan **Sumative:** Accuracy determines conditions necessary to be sufficient (A - (lambda)I) x = 0 has a solution nonzero, accuracy obtains polynomial properties, eigenvalues and eigenvectors.	**Formative Criteria:** **Sumative Criteria:** Quiz (15) dinilai dengan rubrik 01 **Assessment Technique:** Gagal diterjemahkan			Eigenvalues and Eigenvectors	15
5	Apply Elementary Row Operations to find the determinant of a quadratic matrix and the inverse of a non-singular matrix (CPMK-2, CPMK-3)	**Formative:** Gagal diterjemahkan **Sumative:** Using skills elementary row (column) operations to represent a matrix as a result of matrix multiplication elemeter. Accuracy in determining the determinant of the matrix and the inverse of the matrix	**Formative Criteria:** **Sumative Criteria:** **Assessment Technique:** Gagal diterjemahkan			Elementary Row (Column) Operations	0
6	Able to complete computations in n-dimensional Euclidean space. Know the definition of linear transformation in Euclidean space. (CPMK-2, CPMK-3)	**Formative:** Gagal diterjemahkan **Sumative:** Accuracy and skill complete deep computing Euclidean space and prove that the function is a linear transformation (linear operator).	**Formative Criteria:** **Sumative Criteria:** Independent Assignment (15) dinilai dengan rubrik 01 **Assessment Technique:** Gagal diterjemahkan			Euclidean Space and Elementary Linear Transformations	15

7-8	Apply the concept of linear transformation to Euclidean space in matrix language, functional language, or geometric language (reflection, projection, rotation, dilation, contraction). Able to determine eigenvalues and eigenvectors of linear operators. (CPMK-3)	**Formative:** Gagal diterjemahkan **Sumative:** The ability to define and apply the concept of transformation linear in matrix language, functional language, or language geometry (reflection, projection, rotation, dilation, contraction), skills determine eigenvalues and vectors eigen.	**Formative Criteria:** **Sumative Criteria:** Written Exam (20) dinilai dengan rubrik 01 **Assessment Technique:** Gagal diterjemahkan			Representation Linear Transformation on Space Euclidean	20
9-10	Able to define a structured set (equipped with binary operators) as an example of a vector space (sub) or not (sub) vector space. (CPMK-1)	**Formative:** Gagal diterjemahkan **Sumative:** Accuracy proves truth or denial that a set is vector (sub) space, precision define a subspace vector space, capabilities prove the properties of space vector.	**Formative Criteria:** **Sumative Criteria:** Independent Assignment (15) **Assessment Technique:** Test and Non-Test			Vector Space Elementary and Subspace Vectors.	15

11	Able to define a structured set (equipped with binary operators) as an example of a vector space (sub) or not (sub) vector space. (CPMK-1)	**Formative:** Gagal diterjemahkan **Sumative:** Accuracy in proving a set of independent vectors linear or not, accuracy find system solutions deep homogeneous linear equations determine linear independence, accuracy of use deep Wronskian determinants determine the linear independence of set of functions.	**Formative Criteria:** Presentations are assessed based on the oral presentation rubric (attachment) dinilai dengan rubrik 02 **Sumative Criteria:** **Assessment Technique:** Gagal diterjemahkan			Linear independence on Space Vector	0
12-13	Able to determine the basis of vector spaces, especially the solution space for homogeneous linear equation systems. Able to determine the dimensions of a vector space. Able to determine the coordinate vector relative to the base. (CPMK-2, CPMK-3)	**Formative:** Gagal diterjemahkan **Sumative:** Accuracy and skill for determine the basis of space solution of systems of linear equations homogeneous, determining the basis in the range set, determine the dimensions of the space vector, define vector coordinates relative to the base.	**Formative Criteria:** **Sumative Criteria:** Independent Assignment (15) **Assessment Technique:** Test and Non-Test			Base and Dimensions in Vector Space	15

14-15	Able to express the relationship between the main spaces of a matrix: row space, column space, and null space. Able to determine base and dimensions using Elementary Line Operations. (CPMK-1, CPMK-2)	**Formative:** Gagal diterjemahkan **Sumative:** Careful in use Elementary Row Operations in determine the rank and nullity of matrix, thoroughness in apply the equation: rank + nullity= number of matrix columns.	**Formative Criteria:** Presentations are assessed based on the oral presentation rubric (attachment) dinilai dengan rubrik 04 **Sumative Criteria:** Presentation (5) **Assessment Technique:** Test			Line Space and Column Space Matrix	5
16	Be able to state that vector space is an inner product space. Be able to define the inner product of the inner product space. (CPMK-1, CPMK-3)	**Formative:** Gagal diterjemahkan **Sumative:** Accuracy in determining results inner product of the product space inside.	**Formative Criteria:** **Sumative Criteria:** Written Exam (15) dinilai dengan rubrik 01 **Assessment Technique:** Gagal diterjemahkan			Product Space In	15
							100

Matrix of SLO, CLO, and Assessment Method

SLO / CLO	CLO-1	CLO-2	CLO-3
CPL-1 (ILO 1)	Independent Assignment (Weight 15%) Presentation (Weight 5%) Written Exam (Weight 15%)		
CPL-2 (P2)		Quiz (Weight 15%) Independent Assignment (Weight 15%) Independent Assignment (Weight 15%) Presentation (Weight 5%)	
CPL-3 (KU1)			Independent Assignment (Weight 15%) Independent Assignment (Weight 15%) Written Exam (Weight 15%) Written Exam (Weight 20%)
CPL-7 (KK3)			Independent Assignment (Weight 15%) Independent Assignment (Weight 15%) Written Exam (Weight 15%) Written Exam (Weight 20%)

Evaluation Type and Assessment Weight

Type	Assessment Weight
Quiz	15
Independent Assignment	45
Written Exam	20
Presentation	5
Written Exam	15
Total	100

Assessment and Evaluation of Student Achievement of CLOs

SLOs that are charged on the Course	CLO	SUB CLO	Form of Assessment*						Weight	Value	Student Score
			Formative	Sumative							
				Quiz	Independent Assignment	Written Exam	Presentation	Written Exam			
SLO-2	CLO-2	SUB-CLO-4		15	0	0	0	0	15		
SLO-7	CLO-3	SUB-CLO-6		0	15	0	0	0	15		
SLO-7	CLO-3	SUB-CLO-7		0	0	20	0	0	20		
SLO-1	CLO-1	SUB-CLO-8	Presentations are assessed based on the oral presentation rubric (attachment)	0	15	0	0	0	15		
SLO-7	CLO-3	SUB-CLO-10		0	15	0	0	0	15		
SLO-2	CLO-2	SUB-CLO-11	Presentations are assessed based on the oral presentation rubric (attachment)	0	0	0	5	0	5		
SLO-7	CLO-3	SUB-CLO-12		0	0	0	0	15	15		
				15	45	20	5	15	100		

Lampiran Rubrik 01 | ASSESMENT TERTULIS

Kriteria Penilaian	Bobot/Skor Penilaian				
	5	4	3	2	1/0
Konsep/ metode yang digunakan	Penjelasan konsep /metode (*) sangat lengkap dan akurat	Penjelasan konsep/metode (*) cukup jelas tetapi beberapa informasi tidak dituliskan secara lengkap.	Penjelasan konsep/metode (*) kurang jelas dan banyak informasi yang tidak dituliskan	Penjelasan yang dituliskan hampir tidak berkaitan dengan konsep/ metode (*)	Tidak memberikan konsep yang dibutuhkan
Sistematika penulisan/ pembuktian	Sistematika penulisan/ pembuktian sangat jelas dan terstruktur	Sistematika penulisan/ pembuktian cukup jelas namun ada langkah yang hilang	Sistematika penulisan/ pembuktian kurang jelas	Sistematika penulisan/ pembuktian tidak jelas	Jawaban tidak benar/ tidak ada
Interpretasi geometri/ kualitatif/ kuantitatif.	Interpretasi geometri/ kualitatif/ kuantitaBtif (*) tepat dan lengkap	Interpretasi geometri/ kualitatif/ kuantitatif (*) cukup lengkap/ tepat	Interpretasi geometri/ kualitatif/ kuantitatif (*) kurang lengkap/ tepat	Interpretasi geometri/ kualitatif/ kuantitatif(*) tidak lengkap/ tepat	Interpretasi geometri/ kualitatif/kuantitatif(*) tidak benar
Perhitungan/kesimpulan	Perhitungan/ kesimpulan sangat akurat/tepat dan disertai alasan yang mendasarinya	Perhitungan/ kesimpulan cukup akurat/tepat dan disertai alasan yang mendasarinya	Kesimpulan cukup tepat, namun tidak disertai alasan yang jelas	Perhitungan/ kesimpulan kurang akurat/tepat dan tidak disertai alasan yang mendasarinya	Perhitungan/kesimpulan salah