LESSON PLAN

1. Faculty : Mathematics and Natural Science
2. Course/Code : Integral Calculus / MAT 307
3. Credits : Theory: 2 sks, Practice: 1 sks
4. Semester dan duration : Sem: 2 , Duration : 100 minutes
5. Basic Competencies :
   Students are able to determine the indefinite integral of a function and solve differential equations.
6. Success Indicators :
   – Students are able to determine the integral of a function using general formula of integral.
   – Students are able to determine the integral of a function using the properties of indefinite integral.
7. Topic :
   The indefinite integral and the introduction of differential equation
8. Activity :
   Lesson 1

<table>
<thead>
<tr>
<th>Component</th>
<th>Activity</th>
<th>Time Allocation</th>
<th>Methods</th>
<th>Media</th>
<th>References</th>
</tr>
</thead>
</table>
| Opening   | – Explaining the objectives of the lesson  
            – Motivating students by informing the use and the advantage of the topics.  
            – Giving differential problem to investigate the pre knowledge of students | 10 minutes |         |       |            |
| Main      | – Explaining that integration is the opposite of differentiation and use this fact to help students to (re)formulate the formula for the integration of a function.  
            – Giving some integration problems to students  
            – Explaining the properties of indefinite integral | 80 minutes | Expository Discussion |       |            |
Closing
– Summarizing and concluding the explained and learned concepts. 10 minutes

Follow Up
– Giving homework to students

9. Evaluation:
– Essay
– Performance test

Yogyakarta, ............................

Lecturer,

Ariyadi Wijaya, M.Sc
NIP 132310893
LESSON PLAN

1. Faculty : Mathematics and Natural Science
2. Course/Code : Integral Calculus / MAT 307
3. Credits : Theory: 2 sks, Practice: 1 sks
4. Semester dan duration : Sem: 2 , Duration : 50 minutes
5. Basic Competencies :
   Students are able to determine the indefinite integral of a function.
6. Success Indicators :
   – Students are able to determine the integral of a function using general formula of integral.
   – Students are able to determine the integral of a function using the properties of indefinite integral.
7. Topic : The indefinite integral
8. Activity :

<table>
<thead>
<tr>
<th>Component</th>
<th>Activity</th>
<th>Time Allocation</th>
<th>Methods</th>
<th>Media</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opening</td>
<td>– Reflecting the learned topics</td>
<td>5 minutes</td>
<td>Expository</td>
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<tr>
<td></td>
<td>– Motivating students by informing the use and the advantage of the topics.</td>
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</tr>
<tr>
<td>Main</td>
<td>– Giving some integration problems to students</td>
<td>40 minutes</td>
<td>Expository</td>
<td>Discussion</td>
<td></td>
</tr>
<tr>
<td></td>
<td>– Discussing integration problems with students</td>
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<tr>
<td>Closing</td>
<td>– Summarizing and concluding the explained and learned concepts.</td>
<td>5 minutes</td>
<td>Expository</td>
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</tbody>
</table>

Follow Up

9. Evaluation :
   – Essay
   – Performance test

Yogyakarta, ..................................
Lecturer,

Ariyadi Wijaya, M.Sc
NIP 132310893
LESSON PLAN

1. Faculty : Mathematics and Natural Science
2. Course/Code : Integral Calculus / MAT 307
3. Credits : Theory: 2 sks, Practice: 1 sks
4. Semester dan duration : Sem: 2, Duration: 100 minutes
5. Basic Competencies :
   Students are able to determine the indefinite integral of a function and solve differential equations.
6. Success Indicators:
   – Students are able to solve differential equations
   – Students are able to give examples the application of differential equations in real world (e.g. velocity problem)
7. Topic :
   The indefinite integral and the introduction of differential equation
8. Activity :
   Lesson 3

<table>
<thead>
<tr>
<th>Component</th>
<th>Activity</th>
<th>Time Allocation</th>
<th>Methods</th>
<th>Media</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opening</td>
<td>– Explaining the objectives of the lesson</td>
<td>10 minutes</td>
<td>Expository</td>
<td>Discussion</td>
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</tr>
<tr>
<td></td>
<td>– Motivating students by informing the use and the advantage of the topics.</td>
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<tr>
<td></td>
<td>– Giving example about velocity problem (i.e. from a given function of “distance”, students are asked to find the velocity and the acceleration)</td>
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<tr>
<td>Main</td>
<td>– Explaining about differential equation and the methods to solve the differential equation.</td>
<td>80 minutes</td>
<td>Expository</td>
<td>Discussion</td>
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<td></td>
<td>– Providing a stimulating problem of differential equation (e.g. with a given function of acceleration, students are</td>
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<tr>
<td>Time</td>
<td>Description</td>
<td>Duration</td>
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<tr>
<td>5 minutes</td>
<td>asked to find the velocity and the distance). Facilitating the discussion about ”acceleration” problem</td>
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<tr>
<td>Closing</td>
<td>Summarizing and concluding the concept of differential equation.</td>
<td>10 minutes</td>
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<tr>
<td>Follow Up</td>
<td>Giving homework to students. Giving a task to students (in group) to find other examples about the application of differential equation</td>
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</tbody>
</table>

9. Evaluation:
- Essay
- Performance test

Yogyakarta, ............................

Lecturer,

Ariyadi Wijaya, M.Sc
NIP 132310893
LESSON PLAN

1. Faculty : Mathematics and Natural Science
2. Course/Code : Integral Calculus / MAT 307
3. Credits : Theory: 2 sks, Practice: 1 sks
4. Semester dan duration : Sem: 2 , Duration : 50 minutes
5. Basic Competencies :
   Students are able to determine the indefinite integral of a function and solve differential equations.
6. Success Indicators :
   – Students are able to solve differential equations
   – Students are able to give examples the application of differential equations in real world (e.g. velocity problem)
7. Topic :
   The indefinite integral and introduction of differential equation
8. Activity :
   Lesson 4

<table>
<thead>
<tr>
<th>Component</th>
<th>Activity</th>
<th>Time Allocation</th>
<th>Methods</th>
<th>Media</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opening</td>
<td>– Reflecting the concept of differential equation</td>
<td>5 minutes</td>
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<tr>
<td></td>
<td>– Motivating students by informing the use and the advantage of the topics.</td>
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<tr>
<td>Main</td>
<td>– Giving students problems about differential equation</td>
<td>40 minutes</td>
<td>Expository</td>
<td>Discussion</td>
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</tr>
<tr>
<td></td>
<td>– Facilitating presentation and discussion about examples of the applications of differential equation in real world</td>
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<tr>
<td>Closing</td>
<td>– Summarizing and concluding the explained and learned concepts.</td>
<td>5 minutes</td>
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</table>

9. Evaluation :
   Essay and performance test

Yogyakarta, ............................
Lecturer,
LESSON PLAN

1. Faculty : Mathematics and Natural Science
2. Course/Code : Integral Calculus / MAT 307
3. Credits : Theory: 2 sks, Practice: 1 sks
4. Semester dan duration : Sem: 2, Duration: 100 minutes
5. Basic Competencies:
   Students are able to determine and calculate the definite integral of a function using
   the fundamental theorem of integral.
6. Success Indicators:
   Students are able to determine and calculate the definite integral of a function using
   the fundamental theorem of integral.
7. Topic : Definite integral and the fundamental theorem of integral
8. Activity :
   Lesson 5

<table>
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<tr>
<th>Component</th>
<th>Activity</th>
<th>Time Allocation</th>
<th>Methods</th>
<th>Media</th>
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<td>Opening</td>
<td>− Explaining the objectives of the lesson</td>
<td>10 minutes</td>
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<td></td>
<td>− Motivating students by informing the use and the advantage of the topics.</td>
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<tr>
<td>Main</td>
<td>− Giving the examples of differentiation of functions and some indefinite integrals</td>
<td>80 minutes</td>
<td>Expository Discussion</td>
<td></td>
<td>[A]: 337–356</td>
</tr>
<tr>
<td></td>
<td>− Explaining that the result of an integration can be an exact function (i.e. with a defined constant) if more information is given.</td>
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<td></td>
<td>− Explaining the fundamental theorem of integral</td>
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<td></td>
<td>− Giving some integration</td>
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<td>problems to stude</td>
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<tr>
<td>Closing</td>
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<tr>
<td>− Summarizing and</td>
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<td>concluding the</td>
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<td>explained and</td>
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<td>learned concepts.</td>
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<td>− 10 minutes</td>
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<tr>
<td>Follow Up</td>
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</tr>
<tr>
<td>− Giving homework to</td>
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<tr>
<td>students</td>
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</tbody>
</table>

9. Evaluation:
− Essay
− Performance test

Yogyakarta, ............................

Lecturer,

Ariyadi Wijaya, M.Sc
NIP 132310893
LESSON PLAN

1. Faculty : Mathematics and Natural Science
2. Course/Code : Integral Calculus / MAT 307
3. Credits : Theory: 2 sks, Practice: 1 sks
4. Semester dan duration : Sem: 2 , Duration : 50 minutes
5. Basic Competencies : 
   Students are able to determine and calculate the definite integral of a function using the fundamental theorem of integral.
6. Success Indicators : 
   Students are able to determine and calculate the definite integral of a function using the fundamental theorem of integral.
7. Topic : Definite integral and the fundamental theorem of integral
8. Activity : 
   Lesson 6

<table>
<thead>
<tr>
<th>Component</th>
<th>Activity</th>
<th>Time Allocation</th>
<th>Methods</th>
<th>Media</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opening</td>
<td>– Explaining the objectives of the lesson</td>
<td>5 minutes</td>
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<tr>
<td></td>
<td>– Motivating students by informing the use and the advantage of the topics.</td>
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</tr>
<tr>
<td>Main</td>
<td>– Giving some integration problems to students</td>
<td>40 minutes</td>
<td>Expository</td>
<td>[A]: 337–356</td>
<td></td>
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<tr>
<td></td>
<td>– Discussing integration problems with students</td>
<td></td>
<td>Discussion</td>
<td></td>
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</tr>
<tr>
<td>Closing</td>
<td>– Summarizing and concluding the explained and learned concepts.</td>
<td>5 minutes</td>
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<tr>
<td>Follow Up</td>
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</tbody>
</table>

9. Evaluation : 
   Essay and performance test

Yogyakarta, ............................
Lecturer,
LESSON PLAN

1. Faculty : Mathematics and Natural Science
2. Course/Code : Integral Calculus / MAT 307
3. Credits : Theory: 2 sks, Practice: 1 sks
4. Semester dan duration : Sem: 2, Duration: 100 minutes
5. Basic Competencies :
   Students are able to determine the integral of logarithmic, exponential and trigonometric functions.
6. Success Indicators :
   Students are able to determine the integral of a logarithmic function
7. Topic : The integral of transcendent function
8. Activity :
   Lesson 7

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<tr>
<th>Component</th>
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<tbody>
<tr>
<td>Opening</td>
<td>– Explaining the objectives of the lesson</td>
<td>10 minutes</td>
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<tr>
<td></td>
<td>– Motivating students by informing the use and the advantage of the topics.</td>
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<tr>
<td>Main</td>
<td>– Discussing the concept of logarithm and logarithmic function with students.</td>
<td>80 minutes</td>
<td>Expository Discussion</td>
<td></td>
<td>[A]: 449–483</td>
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<tr>
<td></td>
<td>– Explaining the integral of logarithmic functions.</td>
<td></td>
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<td></td>
<td>[A]: 534–539</td>
</tr>
<tr>
<td></td>
<td>– Giving some integration problems to students</td>
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<tr>
<td>Closing</td>
<td>– Summarizing and concluding the explained and learned concepts.</td>
<td>10 minutes</td>
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<tr>
<td>Follow Up</td>
<td>– Giving homework to students</td>
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</table>
9. Evaluation:
   – Essay
   – Performance test

Yogyakarta, ............................

Lecturer,

Ariyadi Wijaya, M.Sc
NIP 132310893
LESSON PLAN

1. Faculty : Mathematics and Natural Science
2. Course/Code : Integral Calculus / MAT 307
3. Credits : Theory: 2 sks, Practice: 1 sks
4. Semester dan duration : Sem: 2 , Duration : 100 minutes
5. Basic Competencies :
   Students are able to determine the integral of logarithmic, exponential and trigonometric functions.
6. Success Indicators :
   Students are able to determine the integral of an exponential function
7. Topic : The integral of transcendent function
8. Activity :
   Lesson 8

<table>
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<tr>
<th>Component</th>
<th>Activity</th>
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</thead>
</table>
| Opening   | – Explaining the objectives of the lesson  
– Asking students to explain the characteristics of exponen  
– Motivating students by informing the use and the advantage of the topics. | 10 minutes |         |       |            |
| Main      | – Discussing the concept of exponen and exponential functions with students.  
– Explaining the integral of exponential functions.  
– Giving some integration problems to students | 80 minutes | Expository Discussion | [A]: 449–483  
[A]: 534–539 |
| Closing   | – Summarizing and concluding the explained and learned concepts. | 10 minutes |         |       |            |
| Follow Up | – Giving homework to students |            |         |       |            |
9. Evaluation:
   - Essay
   - Performance test

Yogyakarta, ............................

Lecturer,

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1. Faculty : Mathematics and Natural Science
2. Course/Code : Integral Calculus / MAT 307
3. Credits : Theory: 2 sks, Practice: 1 sks
4. Semester dan duration : Sem: 2 , Duration : 100 minutes
5. Basic Competencies :
   Students are able to determine the integral of logarithmic, exponential and trigonometric functions.
6. Success Indicators :
   Students are able to determine the integral of a trigonometric function
7. Topic : The integral of transcendent function
8. Activity : 
   Lesson 9

<table>
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<tr>
<th>Component</th>
<th>Activity</th>
<th>Time Allocation</th>
<th>Methods</th>
<th>Media</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opening</td>
<td>- Explaining the objectives of the lesson</td>
<td>10 minutes</td>
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<tr>
<td></td>
<td>- Motivating students by informing the use and the advantage of the topics.</td>
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<td></td>
<td>- Giving questions about trigonometric problems to students</td>
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<tr>
<td>Main</td>
<td>- Discussing the concept of trigonometry and trigonometric function with students.</td>
<td>80 minutes</td>
<td>Expository Discussion</td>
<td>[A]: 449–483</td>
<td></td>
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<tr>
<td></td>
<td>- Explaining the integral of trigonometric functions.</td>
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<tr>
<td></td>
<td>- Giving some integration problems to students</td>
<td></td>
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<td></td>
<td>[A]: 534–539</td>
</tr>
<tr>
<td>Closing</td>
<td>- Summarizing and concluding the explained and learned concepts.</td>
<td>10 minutes</td>
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<tr>
<td>Follow Up</td>
<td>- Giving homework to students</td>
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9. Evaluation:
   – Essay
   – Performance test

Yogyakarta, .........................

Lecturer,

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1. Faculty: Mathematics and Natural Science
2. Course/Code: Integral Calculus / MAT 307
3. Credits: Theory: 2 sks, Practice: 1 sks
4. Semester dan duration: Sem: 2, Duration: 50 minutes
5. Basic Competencies:
   Students are able to determine the integral of logarithmic, exponential and
   trigonometric functions.
6. Success Indicators:
   – Students are able to determine the integral of a logarithmic function
   – Students are able to determine the integral of an exponential function
   – Students are able to determine the integral of a trigonometric function
7. Topic: The integral of transcendent function
8. Activity:
   Lesson 10

<table>
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<th>Component</th>
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<th>Media</th>
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<tbody>
<tr>
<td>Opening</td>
<td>– Explaining the objectives of the lesson</td>
<td>5 minutes</td>
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<tr>
<td></td>
<td>– Motivating students by informing the use and the advantage of the topics.</td>
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<tr>
<td>Main</td>
<td>– Giving students problem of the integration of transcendent function</td>
<td>40 minutes</td>
<td>Expository</td>
<td>[A]: 449–483</td>
<td></td>
</tr>
<tr>
<td></td>
<td>– Discussing integration problems with students</td>
<td></td>
<td>Discussion</td>
<td>[A]: 534–539</td>
<td></td>
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<tr>
<td>Closing</td>
<td>– Summarizing and concluding the explained and learned concepts.</td>
<td>5 minutes</td>
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Yogyakarta, ..................................
Lecturer,

Ariyadi Wijaya, M.Sc
NIP 132310893
### LESSON PLAN

1. **Faculty**: Mathematics and Natural Science  
2. **Course/Code**: Integral Calculus / MAT 307  
3. **Credits**: Theory: 2 sks, Practice: 1 sks  
4. **Semester dan duration**: Sem: 2, Duration: 100 minutes  
5. **Basic Competencies**:  
   Students are able to determine the integral of functions using substitution methods and integration by parts.  
6. **Success Indicators**:  
   Students are able to determine the integral of functions using substitution methods  
7. **Topic**: The techniques of integration  
8. **Activity**: Lesson 11

<table>
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<tr>
<th>Component</th>
<th>Activity</th>
<th>Time Allocation</th>
<th>Methods</th>
<th>Media</th>
<th>References</th>
</tr>
</thead>
</table>
| Opening   | – Explaining the objectives of the lesson  
           – Motivating students by informing the use and the advantage of the topics. | 10 minutes |         |       |            |
| Main      | – Explaining about substitution methods as one of the techniques of integration.  
           – Explaining about the symmetric theorem and periodic rule  
           – Giving integration problems that needs to be solved using substitution methods. | 80 minutes | Expository Discussion |       | [A]: 525–533  
           [A]: 547 - 557 |
| Closing   | – Summarizing and concluding the explained and learned concepts. | 10 minutes |         |       |            |
| Follow Up | – Giving homework to students | | | | |

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DEPARTMENT OF NATIONAL EDUCATION  
YOGYAKARTA STATE UNIVERSITY  
FACULTY OF MATHEMATICS AND NATURAL SCIENCE  
Address: Karangmalang, Yogyakarta – 55281  
Phone: 0274 – 586168 Ext. 217
9. Evaluation:
   – Essay
   – Performance test

Yogyakarta, ..........................

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2. Course/Code : Integral Calculus / MAT 307
3. Credits : Theory: 2 sks, Practice: 1 sks
4. Semester dan duration : Sem: 2, Duration: 100 minutes
5. Basic Competencies :
   Students are able to determine the integral of functions using substitution methods and integration by parts.
6. Success Indicators:
   Students are able to determine the integral of functions using integration by parts.
7. Topic : The techniques of integration
8. Activity :
   Lesson 12

<table>
<thead>
<tr>
<th>Component</th>
<th>Activity</th>
<th>Time Allocation</th>
<th>Methods</th>
<th>Media</th>
<th>References</th>
</tr>
</thead>
</table>
| Opening   | – Explaining the objectives of the lesson  
            – Motivating students by informing the use and the advantage of the topics. | 10 minutes |         |       |            |
| Main      | – Explaining about integration by parts as one of the techniques of integration.  
            – Giving integration problems that needs to be solved using integration by parts. | 80 minutes | Expository Discussion |       | [A]: 525–533  
            |                                                    |           |                     | [A]: 547-557 |
| Closing   | – Summarizing and concluding the explained and learned concepts. | 10 minutes |         |       |            |
| Follow Up | – Giving homework to students | | | | |

9. Evaluation :
   – Essay
   – Performance test
Yogyakarta, ...............................  

Lecturer,  

Ariyadi Wijaya, M.Sc  
NIP 132310893
LESSON PLAN

1. Faculty : Mathematics and Natural Science
2. Course/Code : Integral Calculus / MAT 307
3. Credits : Theory: 2 sks, Practice: 1 sks
4. Semester dan duration : Sem: 2 , Duration : 50 minutes
5. Basic Competencies : Students are able to determine the integral of functions using substitution methods and integration by parts.
6. Success Indicators : Students are able to determine the integral of functions using substitution methods Students are able to determine the integral of a function using integration by parts
7. Topic : The techniques of integration
8. Activity : Lesson 13

<table>
<thead>
<tr>
<th>Component</th>
<th>Activity</th>
<th>Time Allocation</th>
<th>Methods</th>
<th>Media</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opening</td>
<td>Explaining the objectives of the lesson</td>
<td>5 minutes</td>
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</tr>
<tr>
<td></td>
<td>Motivating students by informing the use and the advantage of the topics.</td>
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</tr>
<tr>
<td>Main</td>
<td>Giving integration problems that needs to be solved by either substitution methods or integration by parts.</td>
<td>40 minutes</td>
<td>Expository Discussion</td>
<td></td>
<td>[A]: 525–533 [A]: 547 - 557</td>
</tr>
<tr>
<td></td>
<td>Discussing integration problems with students</td>
<td></td>
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<tr>
<td>Closing</td>
<td>Summarizing and concluding the explained and learned concepts.</td>
<td>5 minutes</td>
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</tbody>
</table>


Yogyakarta, ............................
Lecturer,

Ariyadi Wijaya, M.Sc
NIP 132310893
LESSON PLAN

1. Faculty : Mathematics and Natural Science
2. Course/Code : Integral Calculus / MAT 307
3. Credits : Theory: 2 sks, Practice: 1 sks
4. Semester dan duration : Sem: 2 , Duration : 100 minutes
5. Basic Competencies :
   Students are able to determine the integral of functions using trigonometric and partial integration.
6. Success Indicators :
   Students are able to determine the integral of functions using trigonometric and partial integration.
7. Topic : The techniques of integration
8. Activity :
   Lesson 14

<table>
<thead>
<tr>
<th>Component</th>
<th>Activity</th>
<th>Time Allocation</th>
<th>Methods</th>
<th>Media</th>
<th>References</th>
</tr>
</thead>
</table>
| Opening   | − Explaining the objectives of the lesson  
− Motivating students by informing the use and the advantage of the topics. | 10 minutes |         |       |            |
| Main      | − Explaining about substitution methods as one of the techniques of integration.  
− Explaining about trigonometric and partial substitution  
− Giving integration problems that needs to be solved by trigonometric or partial integration. | 80 minutes | Expository Discussion |       | [A]: 541–546 |
| Closing   | − Summarizing and concluding the explained and learned concepts. | 10 minutes |         |       |            |

9. Evaluation :
   Essay and performance test

Yogyakarta, .........................
Lecturer,

Ariyadi Wijaya, M.Sc
NIP 132310893
LESSON PLAN
1. Faculty : Mathematics and Natural Science
2. Course/Code : Integral Calculus / MAT 307
3. Credits : Theory: 2 sks, Practice: 1 sks
4. Semester dan duration : Sem: 2 , Duration: 50 minutes
5. Basic Competencies :
   Students are able to determine the integral of functions using trigonometric and partial integration.
6. Success Indicators:
   Students are able to determine the integral of functions using trigonometric and partial integration.
7. Topic : The techniques of integration
8. Activity :
   Lesson 15

<table>
<thead>
<tr>
<th>Component</th>
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<th>Methods</th>
<th>Media</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opening</td>
<td>– Explaining the objectives of the lesson</td>
<td>5 minutes</td>
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<tr>
<td></td>
<td>– Motivating students by informing the use and the advantage of the topics.</td>
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</tr>
<tr>
<td>Main</td>
<td>– Giving integration problems that needs to be solved by either trigonometric or partial integration</td>
<td>40 minutes</td>
<td>Expository</td>
<td></td>
<td>[A]: 541–546</td>
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<tr>
<td></td>
<td>– Discussing integration problems with students</td>
<td></td>
<td>Discussion</td>
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<tr>
<td>Closing</td>
<td>– Summarizing and concluding the explained and learned concepts.</td>
<td>5 minutes</td>
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9. Evaluation :
   Essay and performance test

Yogyakarta, ..................................
Lecturer,

Ariyadi Wijaya, M.Sc
NIP 132310893
LESSON PLAN

1. Faculty : Mathematics and Natural Science
2. Course/Code : Integral Calculus / MAT 307
3. Credits : Theory: 2 sks, Practice: 1 sks
4. Semester dan duration : Sem: 2 , Duration: 100 minutes
5. Basic Competencies :
   Students are able to determine the integral of rational functions.
6. Success Indicators:
   Students are able to determine the integral of rational functions
7. Topic : The techniques of integration
8. Activity :
   Lesson 16

<table>
<thead>
<tr>
<th>Component</th>
<th>Activity</th>
<th>Time Allocation</th>
<th>Methods</th>
<th>Media</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opening</td>
<td>– Explaining the objectives of the lesson</td>
<td>10 minutes</td>
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</tr>
<tr>
<td></td>
<td>– Motivating students by informing the use and the advantage of the topics.</td>
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<tr>
<td>Main</td>
<td>– Giving examples of rational functions.</td>
<td>80 minutes</td>
<td>Expository</td>
<td></td>
<td>[A]: 558–567</td>
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<tr>
<td></td>
<td>– Discussing the definition of rational functions.</td>
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<td>Discussion</td>
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<tr>
<td></td>
<td>– Explaining the technique to integrate rational functions.</td>
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</tr>
<tr>
<td></td>
<td>– Discussing problems about the integration of rational functions.</td>
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</tr>
<tr>
<td>Closing</td>
<td>– Summarizing and concluding the explained and learned concepts.</td>
<td>10 minutes</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Follow Up</td>
<td>– Giving homework to students</td>
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</tbody>
</table>

9. Evaluation :
Yogyakarta, .........................

Lecturer,

Ariyadi Wijaya, M.Sc
NIP 132310893
# LESSON PLAN

1. Faculty : Mathematics and Natural Science  
2. Course/Code : Integral Calculus / MAT 307  
3. Credits : Theory: 2 sks, Practice: 1 sks  
4. Semester dan duration : Sem: 2, Duration: 50 minutes  
5. Basic Competencies :    
   Students are able to determine the integral of rational functions.  
6. Success Indicators :    
   Students are able to determine the integral of rational functions  
7. Topic : The techniques of integration  
8. Activity :  
   Lesson 17  

<table>
<thead>
<tr>
<th>Component</th>
<th>Activity</th>
<th>Time Allocation</th>
<th>Methods</th>
<th>Media</th>
<th>References</th>
</tr>
</thead>
</table>
| Opening     | – Explaining the objectives of the lesson  
   – Motivating students by informing the use and the advantage of the topics. | 5 minutes       |              |       |            |
| Main        | – Giving problems about the integration of rational functions.  
   – Discussing integration problems with students | 40 minutes      | Expository Discussion | [A]: 558–567 |            |
| Closing     | – Summarizing and concluding the explained and learned concepts.          | 5 minutes       |              |       |            |
| Follow Up   |                                                                          |                 |              |       |            |

9. Evaluation :  
Yogyakarta, ............................  
Lecturer,

Ariyadi Wijaya, M.Sc  
NIP 132310893
LESSON PLAN

1. Faculty : Mathematics and Natural Science
2. Course/Code : Integral Calculus / MAT 307
3. Credits : Theory: 2 sks, Practice: 1 sks
4. Semester dan duration : Sem: 2, Duration: 100 minutes
5. Basic Competencies :
   Students are able to find the area of flat surface between two curves.
6. Success Indicators :
   Students are able to find the area of various kinds of flat surfaces between two curves.
7. Topic : The area of flat surfaces between two curves
8. Activity :
   Lesson 19

<table>
<thead>
<tr>
<th>Component</th>
<th>Activity</th>
<th>Time Allocation</th>
<th>Methods</th>
<th>Media</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opening</td>
<td>- Explaining the objectives of the lesson</td>
<td>10 minutes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Motivating students by informing the use and the advantage of the topics.</td>
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<tr>
<td></td>
<td>- Giving example about finding the area of rectangle, triangle and square that are placed on a cartesian coordinate</td>
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<tr>
<td>Main</td>
<td>- Explaining the method or formula to calculate area below the x axis</td>
<td>80 minutes</td>
<td>Expository Discussion</td>
<td></td>
<td>[A]: 299–308</td>
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</tbody>
</table>
9. Evaluation:
   – Essay
   – Performance test

Yogyakarta, ............................

Lecturer,

Ariyadi Wijaya, M.Sc
NIP 132310893
## LESSON PLAN

1. Faculty : Mathematics and Natural Science  
2. Course/Code : Integral Calculus / MAT 307  
3. Credits : Theory: 2 sks, Practice: 1 sks  
4. Semester dan duration : Sem: 2 , Duration : 50 minutes  
5. Basic Competencies :  
   Students are able to find the area of flat surfaces between two curves.  
6. Success Indicators:  
   Students are able to find the area of various kinds of flat surfaces formed by two curves.  
7. Topic : The area of flat surfaces between two curves  
8. Activity : Lesson 20  

<table>
<thead>
<tr>
<th>Component</th>
<th>Activity</th>
<th>Time Allocation</th>
<th>Methods</th>
<th>Media</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opening</td>
<td>– Explaining the objectives of the lesson</td>
<td>5 minutes</td>
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<tr>
<td></td>
<td>– Re-explaining the method to find the area of surface between two curves.</td>
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<tr>
<td></td>
<td>– Motivating students by informing the use and the advantage of the topics (i.e. to find the area of special shape that formed by two curves).</td>
<td></td>
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<tr>
<td>Main</td>
<td>– Giving students problems about finding the area of surface between two curves.</td>
<td>40 minutes</td>
<td>Expository Discussion</td>
<td></td>
<td>[A]: 299–308</td>
</tr>
<tr>
<td></td>
<td>– Facilitating a class discussion about the application of the learned topic. And also asking students to find special shape that formed by two curves and can be solved by the method of finding the area between two</td>
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<tr>
<td>Closing</td>
<td>Summarizing and concluding the explained and learned concepts.</td>
<td>5 minutes</td>
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</tr>
</tbody>
</table>

9. Evaluation :
   - Essay
   - Performance test

Yogyakarta, .........................

Lecturer,

Ariyadi Wijaya, M.Sc
NIP 132310893
LESSON PLAN

1. Faculty : Mathematics and Natural Science
2. Course/Code : Integral Calculus / MAT 307
3. Credits : Theory: 2 sks, Practice: 1 sks
4. Semester dan duration : Sem: 2 , Duration: 100 minutes
5. Basic Competencies :
   Students are able to find the volume of solid of revolution using disk method and ring method.
6. Success Indicators :
   – Students are able to find the volume of solid that is formed by rotating a curve about either the x axis or the y axis using disk method.
   – Students are able to find the volume of solid that is formed by rotating the area between two curves about either the x axis or the y axis using ring method
7. Topic : The volume of solid of revolution
8. Activity :
   Lesson 21

<table>
<thead>
<tr>
<th>Component</th>
<th>Activity</th>
<th>Time Allocation</th>
<th>Methods</th>
<th>Media</th>
<th>References</th>
</tr>
</thead>
</table>
| Opening   | - Explaining the objectives of the lesson  
- Showing some special shapes whose volume are difficult to be solved using common formula of volume, such as the formula for the volume of a cube, a sphere, a cone, etc.  
- Motivating students by informing the use and the advantage of the topics, i.e. to find the volume of special shape. | 10 minutes |         |       |            |
| Main      | - Showing some cylinders that are placed on a cartesian coordinate. Asking students to find the volume of the | 80 minutes | Expository Discussion | [A]: 337–356 |
cylinders.
− Connecting a cylinder to the revolution of curve (i.e. cylinder can be formed by rotating a line about a given axis).
− Using the formula of surface area of a cylinder to stimulate students to formulate the method to find the volume of solid of revolution
− Explaining the disk method to find the volume of solid of revolution when the solid is formed by revolving a curve about a given axis.
− Explaining the ring method to find the volume of solid of revolution when the solid is formed by revolving two curves about an axis.
− Discussing the application of disk method and ring method in daily life.

<table>
<thead>
<tr>
<th>Closing</th>
<th>Summarizing and concluding the explained and learned concepts.</th>
<th>10 minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Follow Up</td>
<td>Giving homework to students</td>
<td></td>
</tr>
</tbody>
</table>

9. Evaluation:
Essay and performance test

Yogyakarta, ................................

Lecturer,

Ariyadi Wijaya, M.Sc
NIP 132310893
LEsson Plan

1. Faculty : Mathematics and Natural Science
2. Course/Code : Integral Calculus / MAT 307
3. Credits : Theory: 2 sks, Practice: 1 sks
4. Semester dan duration : Sem: 2 , Duration: 50 minutes
5. Basic Competencies :
   Students are able to find the volume of solid of revolution using disk method and ring method.
6. Success Indicators :
   − Students are able to find the volume of solid that is formed by rotating a curve about either the x axis or the y axis using disk method.
   − Students are able to find the volume of solid that is formed by rotating the area between two curves about either the x axis or the y axis using ring method.
7. Topic : The volume of solid of revolution
8. Activity :
   Lesson 22

<table>
<thead>
<tr>
<th>Component</th>
<th>Activity</th>
<th>Time Allocation</th>
<th>Methods</th>
<th>Media</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opening</td>
<td>− Explaining the objectives of the lesson</td>
<td>5 minutes</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>− Re-explaining the disk method and ring method</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>− Motivating students by informing the use and the advantage of the topics.</td>
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</tr>
<tr>
<td>Main</td>
<td>− Giving students problems about finding the volume of solid of revolution that can be solved using either disk method or ring method.</td>
<td>40 minutes</td>
<td>Expository Discussion</td>
<td></td>
<td>[A]: 337–356</td>
</tr>
<tr>
<td></td>
<td>− Presentation by students about the application of disk method and ring method to solve real life problem</td>
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</tr>
<tr>
<td>Closing</td>
<td>− Summarizing and concluding the explained and learned concepts.</td>
<td>5 minutes</td>
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</tr>
</tbody>
</table>
9. **Evaluation**
   - Essay
   - Performance test

Yogyakarta, ............................
Lecturer,

Ariyadi Wijaya, M.Sc
NIP 132310893
LESSON PLAN

1. Faculty : Mathematics and Natural Science
2. Course/Code : Integral Calculus / MAT 307
3. Credits : Theory: 2 sks, Practice: 1 sks
4. Semester dan duration : Sem: 2 , Duration : 100 minutes
5. Basic Competencies :
   Students are able to find the volume of solid of revolution using cylinder or shell method
6. Success Indicators :
   Students are able to find the volume of solid of revolution using cylinder or shell method
7. Topic : The volume of solid of revolution
8. Activity :
   Lesson 23

<table>
<thead>
<tr>
<th>Component</th>
<th>Activity</th>
<th>Time Allocation</th>
<th>Methods</th>
<th>Media</th>
<th>References</th>
</tr>
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<tbody>
<tr>
<td>Opening</td>
<td>– Explaining the objectives of the lesson</td>
<td>10 minutes</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>– Showing some special shapes whose volume are difficult to be solved using common formula of volume, such as the formula for the volume of a cube, a sphere, a cone, etc.</td>
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<tr>
<td></td>
<td>– Motivating students by informing the use and the advantage of the topics, i.e. to find the volume of special shape.</td>
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</tr>
<tr>
<td>Main</td>
<td>– Showing some cylinders that are placed on a cartesian coordinate. Asking students to find the volume of the cylinders using formula $\pi r^2 t$</td>
<td>80 minutes</td>
<td>Expository Discussion</td>
<td></td>
<td>[A]: 449–483 [A]: 534–539</td>
</tr>
</tbody>
</table>
− Connecting a cylinder to the revolution of curve (i.e. cylinder can be formed by rotating a line about a given axis).
− Using the formula of surface area of a cylinder to stimulate students to formulate the method to find the volume of solid of revolution.
− Explaining the cylinder or shell method to find the volume of solid of revolution.
− Discussing the application of cylinder or shell method in daily life.

<table>
<thead>
<tr>
<th>Closing</th>
<th>Summarizing and concluding the explained and learned concepts.</th>
<th>10 minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Follow Up</td>
<td>Giving homework to students</td>
<td></td>
</tr>
</tbody>
</table>

9. Evaluation :
− Essay
− Performance test

Yogyakarta, ............................

Lecturer,

Ariyadi Wijaya, M.Sc
NIP 132310893
LESSON PLAN

1. Faculty: Mathematics and Natural Science
2. Course/Code: Integral Calculus / MAT 307
3. Credits: Theory: 2 sks, Practice: 1 sks
4. Semester dan duration: Sem: 2, Duration: 50 minutes
5. Basic Competency:
   Students are able to find the volume of solid of revolution using cylinder or shell method.
6. Success Indicators:
   Students are able to find the volume of solid of revolution using cylinder or shell method.
7. Topic: The volume of solid of revolution
8. Activity:
   Lesson 24

<table>
<thead>
<tr>
<th>Component</th>
<th>Activity</th>
<th>Time Allocation</th>
<th>Methods</th>
<th>Media</th>
<th>References</th>
</tr>
</thead>
<tbody>
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<td>Opening</td>
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<td>5 minutes</td>
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<td></td>
<td></td>
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<tr>
<td></td>
<td>Re-explaining the cylinder or shell method</td>
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</tr>
<tr>
<td></td>
<td>Motivating students by informing the use and the advantage of the topics</td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>Main</td>
<td>Giving students problems about finding the volume of solid of revolution</td>
<td>40 minutes</td>
<td>Expository</td>
<td></td>
<td>[A]: 449–483</td>
</tr>
<tr>
<td></td>
<td>that can be solved using cylinder or shell method.</td>
<td></td>
<td>Discussion</td>
<td></td>
<td>[A]: 534–539</td>
</tr>
<tr>
<td></td>
<td>Presentation by students about the application of cylinder or shell method</td>
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<tr>
<td></td>
<td>to solve real life problem</td>
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<td></td>
</tr>
<tr>
<td>Closing</td>
<td>Summarizing and concluding the explained and learned concepts.</td>
<td>5 minutes</td>
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</tbody>
</table>
9. Evaluation:
   - Essay
   - Performance test

Yogyakarta, ..............................
Lecturer,

Ariyadi Wijaya, M.Sc
NIP 132310893
LESSON PLAN

1. Faculty : Mathematics and Natural Science
2. Course/Code : Integral Calculus / MAT 307
3. Credits : Theory: 2 sks, Practice: 1 sks
4. Semester dan duration : Sem: 2 , Duration : 100 minutes
5. Basic Competencies :
   Students are able to find the length of curves using integral.
6. Success Indicators :
   Students are able to find the length of various curves using integral
7. Topic : The length of curves
8. Activity :
   Lesson 25

<table>
<thead>
<tr>
<th>Component</th>
<th>Activity</th>
<th>Time Allocation</th>
<th>Methods</th>
<th>Media</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opening</td>
<td>– Explaining the objectives of the lesson</td>
<td>10 minutes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>– Motivating students by informing the use and the advantage of the topics.</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>– Giving problem about finding the length of arcs of a circle</td>
<td></td>
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</tr>
<tr>
<td>Main</td>
<td>– Re-formulating the formula to calculate the length of circle’s arc when the circle is placed on cartesian coordinate.</td>
<td>80 minutes</td>
<td>Expository Discussion</td>
<td></td>
<td>[A]: 525–533</td>
</tr>
<tr>
<td></td>
<td>– Explaining the technique to find the length of curves.</td>
<td></td>
<td></td>
<td></td>
<td>[A]: 547-557</td>
</tr>
<tr>
<td></td>
<td>– Giving problem about finding the length of curves</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Closing</td>
<td>– Summarizing and concluding the explained and learned concepts.</td>
<td>10 minutes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Follow Up</td>
<td>– Giving homework to students</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
9. Evaluation:
   - Essay
   - Performance test

Yogyakarta, ..........................

Lecturer,

Ariyadi Wijaya, M.Sc
NIP 132310893
LENN PLAN

1. Faculty : Mathematics and Natural Science
2. Course/Code : Integral Calculus / MAT 307
3. Credits : Theory: 2 sks, Practice: 1 sks
4. Semester dan duration : Sem: 2 , Duration : 50 minutes
5. Basic Competencies : 
   Students are able to find the length of curves using integral.
6. Success Indicators : 
   Students are able to find the length of various curves using integral
7. Topic : The length of curves
8. Activity : 
   Lesson 26

<table>
<thead>
<tr>
<th>Component</th>
<th>Activity</th>
<th>Time Allocation</th>
<th>Methods</th>
<th>Media</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opening</td>
<td>– Explaining the objectives of the lesson</td>
<td>5 minutes</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>– Re-explaining the technique to find the length of curves</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>– Motivating students by informing the use and the advantage of the topics.</td>
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</tr>
<tr>
<td>Main</td>
<td>– Giving students problems about finding the length of various kinds of curves using integral.</td>
<td>40 minutes</td>
<td>Expository</td>
<td></td>
<td>[A]: 525–533</td>
</tr>
<tr>
<td></td>
<td>– Class discussion about the length of various curves</td>
<td></td>
<td>Discussion</td>
<td></td>
<td>[A]: 547 - 557</td>
</tr>
<tr>
<td>Closing</td>
<td>– Summarizing and concluding the explained and learned concepts.</td>
<td>5 minutes</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

9. Evaluation : 
   Essay and performance test

Yogyakarta, .........................
Lecturer,

Ariyadi Wijaya, M.Sc
NIP 132310893
LESSON PLAN

1. Faculty : Mathematics and Natural Science
2. Course/Code : Integral Calculus / MAT 307
3. Credits : Theory: 2 sks, Practice: 1 sks
4. Semester dan duration : Sem: 2 , Duration : 100 minutes
5. Basic Competencies :
   Students are able to find the area of the surface of rotated curves.
6. Success Indicators :
   Students are able to find the area of the surface of rotated curves
7. Topic : The surface of revolution
8. Activity :
   Lesson 27

<table>
<thead>
<tr>
<th>Component</th>
<th>Activity</th>
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<th>Methods</th>
<th>Media</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opening</td>
<td>– Explaining the objectives of the lesson</td>
<td>10 minutes</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>– Showing some special shapes whose surface area are difficult to be solved using common formula of volume, such as the formula for the volume of a cube, a sphere, a cone, etc.</td>
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</tr>
<tr>
<td></td>
<td>– Motivating students by informing the use and the advantage of the topics, i.e. to find the volume of special shape.</td>
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</tr>
<tr>
<td>Main</td>
<td>– Showing some cylinders that are placed on a cartesian coordinate.</td>
<td>80 minutes</td>
<td>Expository Discussion</td>
<td></td>
<td>[A]: 541–546</td>
</tr>
<tr>
<td></td>
<td>Asking students to find the volume of surface area.</td>
<td></td>
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<tr>
<td></td>
<td>– Connecting a cylinder to the revolution of curve (i.e. cylinder can be</td>
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</tbody>
</table>
formed by rotating a line about a given axis).
- Using the formula of surface area of a cylinder to stimulate students to formulate the method to find the surface area of revoluted curve.

<table>
<thead>
<tr>
<th>Closing</th>
<th>Summarizing and concluding the explained and learned concepts.</th>
<th>10 minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Follow Up</td>
<td>Giving homework to students</td>
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9. Evaluation:
- Essay
- Performance test

Yogyakarta, ............................

Lecturer,

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LESSON PLAN

1. Faculty : Mathematics and Natural Science
2. Course/Code : Integral Calculus / MAT 307
3. Credits : Theory: 2 sks, Practice: 1 sks
4. Semester dan duration : Sem: 2 , Duration: 50 minutes
5. Basic Competencies :
   Students are able to find the area of the surface of rotated curves.
6. Success Indicators :
   Students are able to find the area of the surface of rotated curves
7. Topic : The surface of revolution
8. Activity :
   Lesson 28

<table>
<thead>
<tr>
<th>Component</th>
<th>Activity</th>
<th>Time Allocation</th>
<th>Methods</th>
<th>Media</th>
<th>References</th>
</tr>
</thead>
</table>
| Opening      | – Explaining the objectives of the lesson  
               – Re-explaining the technique to find the surface area of rotated curves  
               – Motivating students by informing the use and the advantage of the topics. | 5 minutes       |            |       |            |
| Main         | – Giving students problems about finding the surface area of rotated curves using integral.  
               – Class discussion about the surface area of rotated curves in daily life. | 40 minutes      | Expository Discussion |       | [A]: 541–546 |
| Closing      | – Summarizing and concluding the explained and learned concepts.           | 5 minutes       |            |       |            |

9. Evaluation :
   Essay and performance test

Yogyakarta, .........................
Lecturer,

Ariyadi Wijaya, M.Sc
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LESSON PLAN

1. Faculty: Mathematics and Natural Science
2. Course/Code: Integral Calculus / MAT 307
3. Credits: Theory: 2 sks, Practice: 1 sks
4. Semester dan duration: Sem: 2, Duration: 100 minutes
5. Basic Competencies:
   Students are able to find moment and center of gravity using integral.
6. Success Indicators:
   – Students are able to solve problem about moment and center of gravity using integral
   – Students are able to give examples of the application of finding moment and center of gravity using integral.
7. Topic: Moment and center of gravity
8. Activity:
   Lesson 30 dan 31

<table>
<thead>
<tr>
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<th>Methods</th>
<th>Media</th>
<th>References</th>
</tr>
</thead>
</table>
| Opening   | – Explaining the objectives of the lesson  
             – Motivating students by informing the use and the advantage of the topics.  
             – Asking students to explain about centroid of a plane, e.g. a triangle. | 10 minutes | | | |
| Main      | – Giving problem about determining the centroid of a triangle which all of its sides are represented by the equation of straight lines. Explaining a continuous mass distribution along a line.  
             – Explaining the mass distribution on a plane.  
             – Explaining the Pappus theorem to describe the relation between centroid | 80 minutes | Expository Discussion | | [A]: 558–567 |
and the volume of solid of revolution.
− Giving contextual problem about moment and center of gravity.

Closing

10. Summarizing and concluding the explained and learned concepts. 10 minutes

Follow Up

– Giving homework to students

9. Evaluation:
− Essay
− Performance test

Yogyakarta, .........................

Lecturer,

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LESSON PLAN

1. Faculty : Mathematics and Natural Science
2. Course/Code : Integral Calculus / MAT 307
3. Credits : Theory: 2 sks, Practice: 1 sks
4. Semester dan duration : Sem: 2, Duration: 50 minutes
5. Basic Competencies :
   Students are able to find moment and center of gravity using integral.
6. Success Indicators :
   − Students are able to solve problem about moment and center of gravity using integral
   − Students are able to give examples of the application of finding moment and center of gravity using integral.
7. Topic : Moment and center of gravity
8. Activity :
   Lesson 32

<table>
<thead>
<tr>
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<th>Activity</th>
<th>Time Allocation</th>
<th>Method</th>
<th>Media</th>
<th>References</th>
</tr>
</thead>
</table>
| Opening     | - Explaining the objectives of the lesson
              - Motivating students by informing the use and the advantage of the topics. | 5 minutes |        |       |            |
| Main        | - Giving problems about finding moment and center of gravity using integral.
              - Presentation by students and class discussion about the examples of problem about moment and center of gravity encountered in daily life. | 40 minutes | Expository Discussion |       | [A]: 558–567 |
| Closing     | 11. Summarizing and concluding the explained and learned concepts. | 5 minutes |        |       |            |

9. Evaluation :
   Essay and performance test

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