

# Group 1: Integration by Parts

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**Your task:** Create an overview of this topic to present to the class. Use the hints below as a checklist.

**Hints: what to include**

- Write LIPET and explain what it means.
- Explain how to choose  $u$  and  $dv$ .
- Write down the IBP formula (indefinite and definite).
- Watch out for problems that need IBP more than once.
- Watch out for cyclic problems. What do you do when the original integral comes back?
- What do you do when there is only one function, like  $\int \ln x \, dx$ ?

**Worked example to present:** \_\_\_\_\_

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## Group 2: Trigonometric Integrals

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**Your task:** Create an overview of this topic to present to the class. Use the hints below as a checklist.

**Hints: what to include**

- Write down the identities you need (Pythagorean and half-angle).
- $\int \sin^m x \cos^n x \, dx$ : write the strategy for each case. (What if a power is odd? What if both are even?)
- $\int \tan^m x \sec^n x \, dx$ : write the strategy for each case.
- Which substitution do you use in each case?
- What do you do with a product like  $\cos(ax) \cos(bx)$ ?

**Worked example to present:** \_\_\_\_\_

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## Group 3: Trigonometric Substitution

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**Your task:** Create an overview of this topic to present to the class. Use the hints below as a checklist.

**Hints: what to include**

- Make a table of the three types of expressions that call for a trig sub. For each, write the substitution and the identity used.
- Don't forget to substitute for  $dx$ .
- Show how to draw and label the right triangle to get back to  $x$ .
- What do you do if there is a coefficient in front of  $x^2$ ?
- What do you do if the expression under the root is not in one of the three forms?
- What changes for a definite integral?
- Watch out: when is a regular  $u$ -sub enough?

**Worked example to present:** \_\_\_\_\_

## Group 4: Partial Fractions and Rationalizing Substitutions

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**Your task:** Create an overview of this topic to present to the class. Use the hints below as a checklist.

**Hints: what to include**

- What do you check first before decomposing?
- List the types of factors that can appear in the denominator. Write the form of the decomposition for each.
- Show two ways to find the constants.
- Write down the integration formulas you will need at the end.
- Rationalizing subs: when do you use one, and how do you choose  $u$ ? Don't forget to rewrite  $dx$ .
- Watch out for absolute values and for converting back to  $x$ .

**Worked example to present:** \_\_\_\_\_

## Group 5: Improper Integrals of Type I (including $p$ -integrals)

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**Your task:** Create an overview of this topic to present to the class. Use the hints below as a checklist.

**Hints: what to include**

- What makes an integral improper of Type I? How is it different from Type II?
- Write the limit definitions for each type of infinite interval.
- What do you do when both bounds are infinite?
- Define convergent and divergent.
- Write down the  $p$ -integral rule.
- List limits you will need to know, and when L'Hôpital's rule shows up.
- Watch out: always use limit notation.

**Worked example to present:** \_\_\_\_\_