

MA 16020 EXAM 1 STUDY GUIDE

Average Value of a Function: For $f(x)$ defined on $[a, b]$, the average value of $f(x)$ on $[a, b]$ is:

$$f_{AVE}(x) = \frac{1}{b-a} \int_a^b f(x) dx$$

When to use substitution to integrate?

- When you have something containing a function (which we call u) and that something is multiplied by the derivative of u .

Ex. $\int f(u(x)) \cdot u'(x) dx = \int f(u) du$

- **How do you use substitution?**

- Determine if there is an inner function and call that u .

- Take the derivative of u . So you have

$$du = u'(x) dx$$

- Solve for dx .

- Transform the integral using u and dx .

When to use partial fraction decomposition to integrate?

- When you have a fraction with polynomials on the numerator and denominator, and substitution doesn't work.

- **How do you use partial fraction decomposition?**

- Decompose the fraction using the steps outlined in the Handout, **METHOD OF DECOMPOSING INTO PARTIAL FRACTIONS.**

- **Note:** Some integrals will yield $\ln|?|$ and others will need a substitution.

When to use **by parts** to integrate?

- When all else fails
- How do you use **by parts**?
 - Choose u to be the one to differentiate
 - Recall the acronym that tells how to choose u .
L – Logarithmic
A – Algebraic (like polynomials)
T – Trigonometric
E – Exponential
 - Choose dv to be integrated
 - Determine du and v and apply the following formula:

$$u \cdot v - \int v \, du$$

- Note:
 1. You may have to do a substitution within your problem.
 2. You may have to apply by parts more than once.