

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 .

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

- **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 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.