

Quiz 1 will take place on Wednesday, September 26, at 7:30 PM, in Rooms 1-190 and 3-270. Students with last names beginning “A” through “L” should report to Room 1-190; students with last names beginning “M” through “Z” should report to Room 3-270.

Quiz 1 is “open book”: you may refer to the text and other class materials as well as your own notes and scripts; we would also advise you to prepare a short cheat sheet so that you have quick access to key material. In Quiz 1 you may not use any computers, tablets, calculators, or smartphones. The quiz will consist exclusively of multiple-choice questions.

Quiz 1 is on the material of Unit I. In preparation for Quiz 1 you might find the study guide below useful. You should also review the textbook reading for Unit I, your notes from lecture, the MATLAB Exercises Recitation 1 and Recitation 2, as well as the questions in the Unit I Quiz Question Sampler.

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MATLAB:

Data types (in particular, logical and floating point (double)).

Basic operations on scalars: assignment, arithmetic, relational and logical, flow control (if, for, while).

Standard constructs such as (incremented) counter variables, (incremented) summation/accumulation variables, and shuffled recurrence variables.

Single-index arrays: assignment, indexing, indirect indexing (in which the index is itself a single-index array of integers), concatenation, the colon; dotted arithmetic operators; relational and logical operators.

Key MATLAB built-in functions: basic mathematical functions such as the trigonometric and exponential functions; “data” creation and manipulation functions such as `length`, `find`, `sum`, `max`, `min`, `ones`, `zeros`.

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Math and Numerics:

**Interpolation**, univariate: piecewise-constant, left (endpoint); piecewise-constant, right (endpoint); piecewise-linear.

Understand the “piecewise” part in which you find the segment in which the point of interest  $x$  resides; understand the “constant left, constant right, and linear” part which determines (i) the functional form of the interpolant within the segment, and (ii) the interpolation points at which the interpolant and the function (to be interpolated) must agree.

**Integration**, univariate: rectangle rule, left; rectangle rule, right; rectangle rule, midpoint; trapezoidal.

Understand the decomposition over segments as well as the “rule” within each segment; appreciate the geometric/area picture which corresponds to each rule. Also understand the integration formulas in terms of a sum of [quadrature weights  $\times$  function values at quadrature points].

**Differentiation**, univariate: first derivative (forward difference, backward difference, centered difference); second derivative (centered difference).

Understand the points at which the function is evaluated, the point at which the derivative is approximated, and the specific “finite difference” formula.

**Basic Concepts and Attributes:** accuracy, convergence, convergence rate and order, smoothness, resolution, computational cost, memory. These concepts are applicable to interpolation, integration, and differentiation.

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2.086 Numerical Computation for Mechanical Engineers  
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