

# Midterm 1 Conceptual Review

Math 145, Fall 2017

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- Midterm 1 is on Tuesday, October 3 from 5:50 - 7:50 pm in our classroom.
  - The exam will focus on **Chapters 2 and 3**.
  - You may use both sides of a 3" x 5" **note card** (or paper) during the exam.
  - You may use a calculator, but its use should **never** replace a method from class.
  - You are **highly encouraged** to come to the instructor with questions! Look for **office hours** posted on the course website. If you can't make them, feel free to **make an appointment**.
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## Limits (§§2.1 – 2.3, 2.5 – 2.9)

- *Concepts*: average rate of change, instantaneous rate of change, limit of a function as  $x$  approaches a finite number, limit of a function as  $x$  approaches  $\pm\infty$ , left/right-hand limits, basic limit laws, squeeze theorem, limit of indeterminate form
  - *Goals*: Estimate a limit graphically or by making a table, evaluate a limit (or show that it does not exist) using algebraic manipulation (e.g., rewriting the expression by rationalizing or making a common denominator) and/or applying limit laws or other theorems, evaluate a limit of indeterminate form (or show that it does not exist), understand and apply the formal  $\delta$ - $\varepsilon$  definition of a limit to prove that a limit exists
  - *Homework problems*: §2.1: #9, 15, 21, 25, 31; §2.2: #3, 35, 39, 45, 53, 56, 65; §2.3: #21, 26, 33; §2.5: #7, 11, 15, 19, 33, 37, 43, 49, 51; §2.6: 7, 15, 25, 27, 43; §2.7: #15, 23, 25, 27, 29, 31, 37; §2.9: #1, 2, 3, 7
  - *Additional practice problems*: Ch 2 review: #19, 25, 26, 31, 32, 35, 39, 41, 47, 63, 64, 68, 69, 76, 79
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## Continuity (§2.4)

- *Concepts*: continuity of a function at a point, continuity of a function on its domain, left/right continuity, continuity of a piecewise function, basic laws of continuity, continuity of polynomials/other basic functions, continuity of inverse functions, continuity of composite functions
  - *Goals*: determine whether or not a function is (left/right) continuous using the definition or laws, and prove it; determine the points of discontinuity of a function
  - *Homework problems*: §2.4: #11, 19, 33, 43, 45, 49, 59, 61, 63, 82
  - *Additional practice problems*: §2.4: #27, 47, 53, 66; Ch 2 review: #52, 53, 57
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## Intermediate value theorem (§2.8)

- *Concepts*: Intermediate value theorem (IVT)
  - *Goals*: Use the IVT to show that a function attains a value (including a zero), or that two functions intersect
  - *Homework problems*: §2.8: #5, 9, 10, 13, 17, 19, 26, 35
  - *Additional practice problems*: §2.8: #3, 14, 23, 30; Ch 2 review: #71, 75
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## Differentiation (§§3.1 – 3.3, 3.5 – 3.9)

- *Concepts*: derivative of a function at a point, the derivative function, the domain of the derivative function, derivative rules (power/product/quotient/chain rules), derivative linearity laws, derivative formula (derivative of exponential/logarithmic/(inverse) trigonometric functions), derivative of an inverse function, differentiability implies continuity, higher derivatives

- *Goals*: apply the definition of the derivative; find the derivative of a function at a point using the definition, rules, or theorems; find the derivative function and determine its domain; determine whether a function is differentiable at a point (and possibly use this to conclude whether it is continuous there); calculate the (slope of the) tangent line to the point on a graph; find a derivative of an implicit function; find higher derivatives;
  - *Homework problems*: §3.1: #1, 3, 5, 8, 22, 23, 27, 39, 57; §3.2: #5, 6, 14, 27, 29, 31, 36, 43, 45, 51, 71, 73; §3.3: #5, 7, 11, 31, 35, 37, 39, 41-43; §3.5: 15, 21, 28, 31; §3.6: #9, 20, 37, 43; §3.7: #21, 27, 37, 57, 69, 73; §3.8: #9, 13, 15, 21, 23, 25, 45, 61, 65, 71; §3.9: #1, 9, 13, 19, 27
  - *Additional practice problems*: §3.8: #47-48, 53, 72; Ch 3 review: #13, 15, 15, 19, 29, 43, 49, 101, 107
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**Related rates** (§3.4, 3.10)

- *Concepts*: rate of change (of dependent functions)
- *Goals*: apply derivatives to calculate rates of change
- *Homework problems*: §3.4: 11, 21, 25; §3.10: #3, 5, 7, 13, 19, 25, 35, 37, 38, 39
- *Additional practice problems*: §3.4: #17, 23, 31; §3.10: #9, 15, 30, 33