

640:151 Calculus I Review Exercises, Fall 2012

Department of Mathematics, Rutgers University

This course covers sections 1.1-6.1 from your textbook. Please note that the exercises listed are intended to assist you in reviewing the main topics of the course outlined below, but it is not to be used as a template for your final examination. You will also have problems that do not resemble these review problems.

1. Things you should know from precalculus

- values of $\sin x$, $\cos x$ for $0, \frac{\pi}{6}, \frac{\pi}{4}, \frac{\pi}{3}, \frac{\pi}{2}, \pi, \dots$
- graphs of common functions (trigonometric, polynomials, exponentials and logarithms)
- how to shift/scale common graphs (e.g. given $\sin x$, graph $5 + 15 \sin(\pi x + 7)$)
- inverse functions, domain and range
- equation of a line (slope-intercept: $y = mx + b$, point-slope: $y - y_0 = m(x - x_0)$)

2. Definitions

- $\lim_{x \rightarrow a} f(x)$ exists/does not exist (also $\lim_{x \rightarrow a^\pm} f(x)$ exists/does not exist)
- $\lim_{x \rightarrow \pm\infty} f(x)$ exists/does not exist
- $f(x)$ is continuous/discontinuous at a
- $f(x)$ is differentiable/not differentiable at a
- $f(x)$ is integrable/not integrable on $[a, b]$, $f(x)$ has an antiderivative on $[a, b]$
- Note: you will *not* be required to compute definite integrals using Riemann sums

3. Important Concepts

- Limit Laws, Squeeze Theorem, Trigonometric Limits, L'Hopital's Rule
- Product, Quotient, Chain Rule, Implicit Differentiation
- Substitution Rule for Integrals, Net Change Theorem

4. Theorems (you should know the full hypotheses and statements of these results)

- Intermediate Value Theorem
- Mean Value Theorem
- Fundamental Theorems of Calculus (two parts)

5. Methods/Techniques to Practice

- Graph sketching (critical/inflection points, Derivative Tests, vertical/horizontal asymptotes)
- Word Problems (Optimization, Related Rates),
- Areas between curves of type: $\int f(x) - g(x) dx$
- Note: you will *not* be required to compute areas along the y -axis (of type $\int a(y) - b(y) dy$)

6. Suggested Chapter Review Exercises

- Chapter 1 (pp. 56–58): #21, 23, 43, 47, 49
- Chapter 2 (pp. 117–119): #21, 31, 43, 47, 55, 61, 71
- Chapter 3 (pp. 203–206): #7, 53, 57, 69, 75, 93, 103, 113, 119, 121
- Chapter 4 (pp. 282–285): #11, 23, 39, 52, 63, 68, 75, 87, 97, 105
- Chapter 5 (pp. 353–356): #25, 33, 41, 55, 65, 69, 75, 91,
- Chapter 6 (pp. 397–399): #9, 11, 12