640:152 Calculus II
Review Exercises, Spring 2014

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This course covers selected sections from Chapters 5-11 in your textbook. Please note that the exercises listed are intended to assist you in reviewing the main course topics, but they are not to be used as a template for your final examination. You will have questions that do not resemble these review problems.

1. Things you should know from precalculus & Calculus 151
   - values of $\sin x$, $\cos x$ for $0, \frac{\pi}{6}, \frac{\pi}{4}, \pi, \ldots$ and trig identities
   - definition of hyperbolic trig functions ($\sinh x, \cosh x, \tanh x, \ldots$) and basic identities
   - graphs of common functions ($\cos x, e^x, \log, \tanh x, \ldots$), shifting/scaling (e.g., $5 + 15 \arcsin(\pi x + 7)$)
   - sequences (boundedness, monotonicity, geometric sequence $a_n = cr^n$)
   - limits (limit laws, L'Hopital's Rule, squeeze theorem), asymptotes (vertical and horizontal)
   - equation of the tangent line of a function $f(x)$ at $x = a$
   - exponential growth/decay
2. Definitions
   - $\lim_{x \to a} f(x)$ exists/does not exist (also $\lim_{x \to a^{\pm}} f(x)$ exists/does not exist), $\lim_{x \to \pm\infty} f(x)$ converges/diverges
   - Riemann Integral $\displaystyle\int_a^b f(x)dx = \lim_{N \to \infty} \sum_{j=1}^{N} f(x_j^*)\Delta x$
   - improper integral converges/diverges, e.g., $\displaystyle\int_a^{\infty} f(x)dx$, $\displaystyle\int_a^b f(x)dx$ where $f(x)$ has a discontinuity at a, b or an interior point c in (a, b).
   - $\displaystyle\sum_{n=1}^{\infty} a_n$ converges, converges absolutely vs. conditionally, diverges
   - partial sums, geometric series, p-series
   - power series of a function, radius of convergence
   - Taylor/Maclaurin series, Taylor/Maclaurin polynomial
   - first-order, linear, separable differential equations

3. Important Concepts

   - Fundamental Theorems of Calculus/Net Change Theorem
   - areas between curves (Cartesian $y = f(x)$ or polar $r = f(\theta)$)
   - volume of a solid body (cross sections, solids of rotation: disk, annulus or cylindrical shell methods)
   - left/right Endpoint, Midpoint, Trapezoidal, Simpson's Rules *Note: you do NOT need to memorize the error formulas for these rules!*
   - Maclaurin series for $\ln(1-x), \sin x, \cos x, e^x, \frac{1}{1-x}$ and radius of convergence of each
   - arclength & surface area (in Cartesian, parametric, and polar forms)
   - graphing polar curves and converting between Cartesian and polar coordinates
   - parametric curves/polar curves
   - separation of variables/finding solutions to differential equations

4. Methods/Techniques to Practice

   - integration techniques (Integration by Parts, Trigonometric Integrals, Trig Substitution, Hyperbolic Integrals, Partial Fractions and combinations therein)
   - tests for convergence/divergence of infinite series (Test for Divergence, Leibniz or Alternating Series Test, Comparison Test, Limit Comparison Test, Integral Test, Ratio Test, Root Test)
   - finding Maclaurin series for a function (by hand or from known Maclaurin series) and calculating related limit/derivative/integral

5. Suggested Chapter Review Exercises

   - Ch 5 (pp. 353–356): #9, 25, 33, 41, 55, 65, 69, 75, 91, 99
   - Ch 6 (pp. 397–399): #4, 6, 9, 10, 11, 15, 17, 26, 34, 35, 45, 46
   - Ch 7 (pp. 463–466): #20, 23, 28, 31, 40, 43, 57, 64, 80, 82, 92, 102
   - Ch 8 (pp. 499–501): #2, 11, 23
   - Ch 9 (pp. 534–536): #1, 2, 9, 10
   - Ch 10 (pp. 603–606): #8, 17, 19, 23, 31, 56, 61, 62, 78, 92, 98, 99, 101, 112, 118
   - Ch 11 (pp. 655–656): #2, 3, 7, 12, 18, 22, 24, 30, 33, 34, 37, 38