Yale University, Department of Mathematics
Math 115 Calculus
Fall 2013

Final Exam Review Guide

When/Where. The Final Exam will take place during 7:00 – 10:30 pm on Sunday, December 15th, 2013 in Davies Auditorium, located underground between Dunham Labs and the Becton Center.

Directions. You will have 3 hour and 30 minutes to complete the Final Exam. No electronic devices will be allowed. No notes will be allowed. You will receive an integral table (the same one from the midterms). On all problems, you will have to show your work to get full credit.

Topics covered and practice problems.

- Evaluating definite integrals using the Fundamental Theorems of Calculus. Interpretation of definite integral as "net change". "Area so far" functions and their graphs. Indefinite integrals. Practice problems §5.3 #1–48, 56–63; §5.4 #5–12, 14–18, 21–39, 41–46, 49–58, 68–71.
- u-substitution. Practice problems §5.5 #1–36, 38–48, 53–73, 77–78, 80–84, 85–92.
- Area between curves. Finding the intersection points of curves. Practice problems §6.1 #15–28, 47–48.
- Volume of solids. Using cross section areas. Disk/washer method. Shell method. Practice problems §6.2 #1–18, 39–42; §6.3, #1–20, 29–32, 39–43.
- Integration by parts. Practice problems §7.1 #3–24, 26–46, 61–64, 67–69.
- Integration using multiple methods. Practice problems §7.5 #1–6, 8–10, 13–14, 18–19, 22–24, 37–38, 43–50, 55–57, 63–66, 71–72, 78–79.
- Integration by table look-up. Practice problems §7.6 #1–11, 13–29.
- Approximate integration. Midpoint, trapezoid, and Simpson's rule. Practice problems §7.7 #1–2, 5–18, 19–21 (part (a)), 29–30, 36–38, 45–48.
- Improper integrals. Practice problems §7.8 #1–3, 5–42, 49–54, 57–59, 63, 76–79.
- Arc length of graphs of functions. Practice problems §8.1 #3–18, 23–26, 35–39.
- Surface area of solids of revolution. Practice problems §8.2 #5–20, 25–36.
- Parametric curves. Sketch curves given a parameterization and given graphs of parameters. Find Cartesian equations. Find parameterization given a description. Practice problems §10.1 #1–18, 23–28, 40–46.

- Tangents, area under, arc length, and surface area of parametric curves. Practice problems §10.2 #1–20, 27–30, 32–35, 37–44, 48–54, 57–63, 65–66.
- Polar coordinates. Graphing, computing tangent slopes, area, and arc length of polar functions. Practice problems §10.3 #1–48, 49–51, 54–64; §10.4 #1–50.
- Sequences. Practice problems §11.1 #3–56, 64–78.
- Series. Geometric series. Tests: Test for Divergence, Integral Test, Comparison Test, Alternating Series Test, Ratio Test, Root Test. Absolute convergence. Error bounds and estimating series. Practice problems §11.2 #27–42; §11.3 #3–32, 36–42; §11.4 #1–32, 33–36, 38–46; §11.5 #1–20, 23–31, 32–34; §11.6 #2–30, 35–37; §11.7 #1–38.
- Power series. Radius of convergence. Practice problems §11.8 #3–28, 31–33, 41–42.
- Functions as power series. Differentiating and integrating power series. Practice problems §11.9 #3–10, 13–20, 25–32, 39–40.
- Taylor series. Taylor polynomials. Taylor's inequality. Binomial series. Multiplication of power series. Practice problems §11.10 #1–20, 25–38, 45, 47–59, 63–70.
- Using Taylor's Inequality to estimate functions by Taylor polynomials. Practice problems §11.11 #13–21 (parts (a),(b)), 27–29 (don't need to check graphically).

True/False practice quizzes.
(Found in the Review section at the end of each chapter.)

- Chapter 5, #1–18.
- Chapter 7, #5–8, 10–14.
- Chapter 10, #1–7.
- Chapter 11, #1–22