

Math 1B Handout: Midterm Review

GSI: Theo Johnson-Freyd
<http://math.berkeley.edu/~theo/f/08Summer1B/>

Monday, 21 July 2008

You will have 110 minutes to complete the midterm tomorrow. You may bring one page (front and back) of notes.

Outline of midterm

1. (10 pts) Evaluate the following indefinite integral.
2. (10 pts) Evaluate the following definite integral.
3. (10 pts) Compute the surface area of the surface formed by rotating the curve $\{y = f(x) : a \leq x \leq b\}$ around the x -axis. (Or perhaps around the y -axis.)
4. (15 pts — 3 pts each) For each of the following five improper integrals, decide whether the integral converges or diverges. You do not need to provide any work or justification — full marks will be given for simply the correct answer.
5. (10 pts — 2 pts each) Match the following first-order differential equations to the corresponding direction fields. For each differential equation, state whether it is (a) linear (b) separable (c) both (d) neither.
6. (20 pts) 1st-order initial-value “mixing” problem. Most likely will result in a separable ODE.
7. (25 pts) 2nd-order initial-value “spring/circuit” problem. Most likely will result in a linear ODE that requires variation of parameters.

What you need to know

Techniques of Integration Be sure you can do the Chapter Six Review problems 1–40.

- u -substitutions
- Integration by parts
- Trigonometry, including trigonometric identities (see Rob’s website)

- Trigonometric substitutions
- Partial Fractions Decomposition

Advanced Integration Chapter Six Review problems 41–50, and the Chapter Seven Review 25-26

- Improper integrals. Know both types, including the p -tests and comparison test for both.
- Surface areas of surfaces of revolution.

First-order differential equations Chapter Seven Review 39-43

- Know how to set up word problems. In particular, know how to set up mixing problems and growth-rate problems.
- Separable ODEs. Linear ODEs.
- Initial-value problems

Second-order differential equations Chapter 17 Review 1-14, 18

- Know how to set up word problems. In particular, know how to set up equations modeling springs and series (capacitor, inductor, resistor) circuits.
- Linear ODEs with constant coefficients $ay'' + by' + cy = g(t)$. In particular, know the method of Variation Of Parameters.
- Initial-value and boundary-value problems