

# Practice problems for midterm 1

Calculus II, section 3

February 12

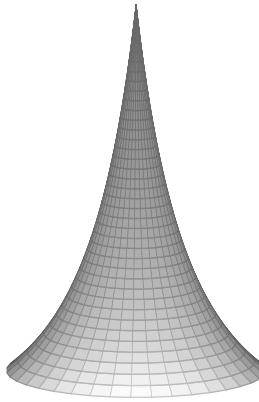
These are practice problems for the content of the first midterm. This is *not* a practice test, and you should not expect it to approximate the test in either length or difficulty; the problems on the test will likely be shorter and easier, at least on average. However, if you know the material well enough to be able to solve these problems, you are well-prepared for the midterm.

We'll go over these problems, among others, in class on Monday; full written solutions will be posted Monday night for your use in studying. I encourage you to attempt them prior to that on your own.

**Problem 1.** Compute the integral  $\int \frac{x^2+x+2}{x^3+2x} dx$ .

**Problem 2.** Use integration by parts to compute  $\int x^2 \log x dx$ .

**Problem 3.** Consider the solid given by rotating about the  $y$ -axis the area bounded by the  $y$ -axis, the  $x$ -axis, and the curve  $y = \frac{1}{\sqrt{x}} - 1$ .



1. Compute its volume using the method of cylindrical shells.
2. Compute its volume as the integral of the areas of circular layers, stacked vertically.

**Problem 4.** Compute  $\int x^2 \sqrt{1 - x^2} dx$ .

**Problem 5.** Determine whether the following integrals converge, and if so compute them.

1.  $\int_{e^2}^{\infty} \frac{\log x + \sin x}{x} dx$

$$2. \int_{-1}^1 \frac{1}{\sqrt{1-x^2}} dx$$

$$3. \int_1^2 x^2 \log(x^3 - 1) dx$$

$$4. \int_1^\infty \frac{1+\log x}{x^x} dx$$