

Correction: 7.2 26. 28/15

## A Sample Midterm for Midterm II<sup>1</sup>

- (1) (15 points) Estimate  $\int_0^{2\pi} \sin(x + \pi/4) dx$  using
- (a) (5 points) Midpoint Rule with  $n = 4$ ;
  - (b) (5 points) Trapezoidal Rule with  $n = 4$ ;
  - (c) (5 points) Simpson's Rule with  $n = 4$ .
- (2) (15 points) Determine whether the following improper integrals are convergent or divergent. You must justify your answers.

(a) (5 points)  $\int_0^1 x^{-3/2} \sin x dx$

(b) (5 points)  $\int_1^{\infty} \frac{dx}{e^x + x^2}$

(c) (5 points)  $\int_1^{\infty} \frac{dx}{\sqrt{x^4 + 1}}$

- (3) (40 points) Let  $R$  be the region bounded by the curves  $x = e^y$ ,  $x = 0$ ,  $y = 0$  and  $y = 1$ .
- (a) (10 points) Let  $S_1$  be the solid obtained by rotating  $R$  around the  $x$ -axis. Find the volume of  $S_1$ .
  - (b) (10 points) Let  $S_2$  be the solid obtained by rotating  $R$  around the  $y$ -axis. Find the volume of  $S_2$ .
  - (c) (20 points) A tank full of water has the shape of  $S_2$  as in part (b) (the top of the tank is on the line  $y = 1$  and its bottom is on  $y = 0$ ; all coordinates are measured in meters). Find the work required to pump the water out of the tank. (Use the fact that the density of water is 1000 kg/m<sup>3</sup> and take  $g = 10$  m/s<sup>2</sup> to make your computation simple.)

- (4) (30 points) Evaluate the following integrals.

(a) (5 points)  $\int \frac{e^t - 1}{e^t + 1} dt$

(b) (5 points)  $\int_0^{\pi/4} (\sin 5x)(\sin 2x) dx$

(c) (5 points)  $\int \frac{dx}{x\sqrt{x^2 + 3}}$

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<sup>1</sup><http://www.math.ucsb.edu/~xichen/math3b00w/p2.pdf>

(d) (5 points)  $\int x^3 e^x dx$

(e) (10 points)  $\int \frac{1}{x^4 - 1} dx$

**A Reminder for Time & Location of the Final:** Mar.  
20, 7:30 - 10:30pm, Phelps 1260