

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

- (1) (30 points) Let  $R$  be the region bounded by the curves  $x = e^y$ ,  $x = 0$ ,  $y = 0$  and  $y = 1$ .
- (a) (10 points) Find the area of  $R$ .
  - (b) (10 points) Let  $S_1$  be the solid obtained by rotating  $R$  around the  $x$ -axis. Find the volume of  $S_1$ .
  - (c) (10 points) Let  $S_2$  be the solid obtained by rotating  $R$  around the  $y$ -axis. Find the volume of  $S_2$ .
- (2) (20 points) Suppose that 2 J of work are needed to stretch a spring from its natural length of 30 cm to a length of 42 cm. How much work is needed to stretch it from 35 cm to 40 cm?
- (3) (50 points) Evaluate the following integrals.

(a) (10 points)  $\int \frac{dx}{4x^2 - 1}$

(b) (10 points)  $\int_0^{\pi/4} \sin^2 x \cos^3 x dx$

(c) (10 points)  $\int x^2 \ln x dx$

(d) (10 points)  $\int_0^2 x e^{3x} dx$

(e) (10 points)  $\int \frac{dx}{x^2 + 4x + 5}$

---

<sup>1</sup><http://www.math.ucsb.edu/~xichen/math3b02w/p2.pdf>