

**Math 25****Practice Exam 1****Spring 2016***(Note: this test is probably too long, and some of the integrals are a little tricky.)*

1.  $\int_0^{\pi/2} (\cos 2x) e^{\sin 2x} dx$

2.  $\int \frac{2x+1}{2x^2+4x} dx$

3.  $\int \frac{e^t dt}{1+e^{2t}}$

4.  $\int_1^4 \sqrt{x} \ln x dx$

5.  $\int_1^{\infty} \frac{x}{(1+x^2)^3} dx$

(For #5, if the integral represents area of a region, what can you say about the region?)

6. You have a cylindrical mug 10 cm wide and 20 cm tall. It is full of tea into which you have poured some sugar. The sugar settles toward the bottom, so the density of sugar is  $3(20 - h)$  mg/cm<sup>3</sup> at height  $h$  cm from the bottom of the mug. Find the TOTAL MASS OF SUGAR in the mug. (You like your tea really sweet.)

7. Having taken up the game of rugby upon your arrival at Swarthmore, you are delighted to discover that the rugby ball has exactly the same shape as the solid you get by revolving a region around the line  $y = 4$ . The region you use is bounded by the line  $y = 4$  and the curve  $y = (x^2)/9$ .

(a) Give a Riemann sum that approximates the volume of the ball using slices.

(b) Find the volume of the ball.

8. You and your Math 25 classmates decide to build a pyramid on Parrish Beach to help celebrate the first day of spring. It will have a square base just 10 feet on a side and will have height 10 feet. (You don't want it to be too large - that would be pretentious.)

SET UP an integral to compute the volume of the pyramid. DO NOT EVALUATE.

9. You decide to save for retirement beginning at age 25 and continuing for 40 years. You plan to make contributions using a continuous income stream of \$1000/year for the first 10 years, then \$10,000/year thereafter. Assuming an interest rate of 5%, how much will you have when you retire at age 65? (You need not simplify your answer arithmetically.)