RED

Instructor: Todd Fisher

Math 113 Section 13: Fall 2011
Midterm 1

PRINT NAME:_____

Sign the following pledge below:
I pledge on my honor that I have not given or received any unauthorized assistance on this assignment/examination.

SIGNATURE:_____

1. Find the volume obtained by rotating the region bounded by $y = x^2$ and $y = x^3$ for $x \in [0, 1]$ about

   (i) the x-axis,

   (ii) the y-axis.

2. Suppose that Sue runs faster than Ruth in the first 5 seconds of a 100m race. If $s(t) = 1.5t$ is Sue's speed in meters per second and $r(t) = t$ is Ruth's speed in meters per second, then what is the physical meaning of the area between the curves? Finally, find the area between the curves for $0 \leq t \leq 5$.

3. What is the average value of $h(x) = 5\pi \cos^4 x \sin x$ on the interval $[0, \pi]$?

4. A force of 9 lb. is required to hold a spring stretched 3 feet beyond its natural length. How much work is required to stretch the spring an additional 2 feet?

5. Evaluate the integral

$$\int \frac{dx}{x^2\sqrt{4-x^2}}$$

6. Find a trigonometric substitution for the following integral, **BUT DO NOT SOLVE**.

$$\int \frac{x}{\sqrt{4x^2-7}}\,dx$$

7. Evaluate the integral

$$\int \frac{x^5+1}{x^4-1}\,dx$$

8, Evaluate the integral

$$\int_4^9 \frac{\ln y}{\sqrt{y}}\, dy$$

9. Evaluate the integral

$$\int \cos^6 x \tan^3 x\, dx$$

10. Find the volume of a pyramid whose base is square with side length of the square 3m and height 4m.

11. Evaluate the integral

$$\int \sqrt{\frac{1+x}{1-x}}\, dx$$

12. A bucket that weighs 4 lb. and a rope of negligible weight are used to draw water from a well that is 80 feet deep. The bucket is filled with 40 lb. of water and pulled up at a rate of 2 ft/s, but water leaks out of a hole in the bucket at a rate of 0.2 lb/s. Find the work done in pulling the bucket to the top of the well.