

\_\_\_\_\_ / 50 total points

**Test #1**

Name: \_\_\_\_\_

Math 181, Section 4, Prof. Beydler

Wednesday, September 27, 2017

**Directions:** Show all work. No books or notes. A **scientific calculator** is allowed. Your desk and lap must be clear (no phones, no smart watches, etc.). If you have a phone in your lap or on your chair, it is considered cheating, and you will receive a zero on this test. Write your answers in the indicated places, or box your answers. Good luck!

1. (6 points) Find the area of the region(s) enclosed by  $y = \cos x$ ,  $y = -\cos x$ , and  $0 \leq x \leq \pi$ .

Answer: \_\_\_\_\_

2. (5 points) The base of a solid is the region between  $y = x$  and  $y = x^2$ . Cross-sections perpendicular to the  $x$ -axis are isosceles triangles with hypotenuse along the base. Find the volume of the solid.

Answer: \_\_\_\_\_

3. (4 points) **Set up (but do not evaluate) an integral** to find the volume of the solid generated by revolving the region bounded by the following curves about the line  $y = -1$ .

$$y = x^2 + 1, y = 3 - x^2$$

Answer: \_\_\_\_\_

4. (4 points) **Set up (but do not evaluate) an integral** to find the volume of the solid generated by revolving the region bounded by the following curves about the  $y$ -axis.

$$y = \sin x, y = \frac{1}{2}, \frac{\pi}{6} \leq x \leq \frac{5\pi}{6}$$

Answer: \_\_\_\_\_

5. (2 points) A spring has a natural length of 3 m. It takes 10 N of force to stretch the spring to a total length of 5 m. How much work is done in stretching the spring from a total length of 4 m to a total length of 6 m? Be sure to write the units for your answer.

Answer: \_\_\_\_\_

6. (5 points) A 5-lb rope is 10-ft long and hangs down from a 20-ft-tall building. A 6-lb weight is attached to the end of the rope. Assuming the rope's mass is uniformly distributed, how much work is done lifting the rope and the weight to the top of the building? Be sure to write the units for your answer.

Answer: \_\_\_\_\_

7. (6 points) A 5-m-long trough with semicircular cross-sections is filled with water. The diameter of the semicircles is 4 m. How much work is required to pump the water to 2 meters above the top of the trough? Use  $1000 \text{ kg/m}^3$  for the mass density of water, and be sure to write the units for your answer.

Answer: \_\_\_\_\_

8. (4 points) Find the average value of  $f(x) = \frac{x^2}{(x^3+3)^2}$  on the interval  $[-1, 1]$ .

Answer: \_\_\_\_\_

9. (4 points) Find the following integral.

$$\int x \ln x \, dx$$

Answer: \_\_\_\_\_

10. (4 points) Find the following integral.

$$\int \tan^4 x \sec^4 x \, dx$$

Answer: \_\_\_\_\_

11. (6 points) Find the following integral.

$$\int \frac{1}{\sqrt{x^2 + 4x + 3}} dx$$

Answer: \_\_\_\_\_

Here are a couple of formulas I promised to give you:

$$\int \sec x dx = \ln |\sec x + \tan x| + C$$

$$\int \csc x dx = -\ln |\csc x + \cot x| + C$$