**Math 252 -- Calculus II -- Lab 5 -- B. Plassmann**

**Names:**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**Labs are best if done in your group, during lab time.**

Late labs will be penalized 20%, and will only be accepted up to one week late.

Any group lab turned in by an individual will be penalized 10%.

**Rules:**

Work together:

Everyone works on the same problem at the same time.

Everyone agrees on the solution before you move on.

Remember that you are practicing your mathematical

communication skills!

Turn in one paper per group. Make sure that the paper you turn in is clean, clear, and organized.

**Part 1: Still Integration by Substitution…**

Below are three different integrals, which all happen to have the same answer. You have these jobs:

1. Find each answer, check that they are equal -- getting a decimal by using your calculator is fine.
2. Show why the areas are equal, by using substitution.

**(A) **

**(B) **

**(C) **

Why does A equal B?

Why does B equal C?

Why does C equal A?

**Part 2: Practice Finding Area Between Curves.**

For each of the following problems:

1. Sketch the relevant area, marking your scale.
2. Draw the representative rectangle and label its measurements.
3. Set up an integral to find the area.
4. Solve the integral, expressing your answer in exact (not decimal) form.

**(1)** The area bounded by  (a.k.a. x = \_\_\_\_\_\_\_\_ ), , and the y-axis. Solve with vertical rectangles.

**(2)** The area bounded by  (a.k.a. x = \_\_\_\_\_\_\_\_ ), , and the y-axis. Solve with horizontal rectangles.

**Part 3: Practice with volumes**

For each of the following problems:

1. Sketch the relevant area (before rotation), marking your scale.
2. Draw the representative rectangle.
3. Label or list the measurements you will need to find the volume.
4. Find the volume of the representative disk, washer, or cylinder.
5. Set up the integral to find the volume of the whole shape.
6. Solve the integral, expressing your answer in exact (not decimal) form.

**(1)** Start with the area bounded by , , and , then rotate around the line . Use disks or washers.

**(2)** Start with the area bounded by , , and , then rotate around the line . Use cylindrical shells.