MATH 1910: Exam 2 Bonus Name: UUID:

Each question will be graded based on effort alone. Feel free to use the textbook or material from other sources to investigate these questions. I also don't mind if you work together on it. For each problem you can get either 0 or 2 points added to your exam score. The only requirement to score 2 points on a single problem is that you show me that you made an effort to think about it. So you can get as much as 10 points added to your gross exam score. Since it was a 100 point exam this corresponds to a whole letter grade.

Due: November 18th

1. Find an antiderivative for $\tan(x)$. Try representing $\tan(x)$ as $\frac{\sin(x)}{\cos(x)}$. Then identify a function and it's derivative in that representation. You have two choices for the function: $\sin$ or $\cos$. Which choice allows you to do the chain rule backward?

2. Draw a region whose area can be represented by
$$\int_{-1}^{1} \sqrt{1-x^2}\, dx - \int_{-1}^{1} |x| - 1\, dx.$$
Do the same for
$$\int_{-1}^{1} \sqrt{1-x^2}\, dx + \int_{-1}^{1} |x| - 1\, dx.$$

3. What is the volume of

4. Suppose you have an anologue clock whose battery is dying. At time t the radial speed of the minute hand is $m_{clock}(t) = \frac{\pi}{30}e^{-0.0001t} - 0.017$ radians/minute. How long will it take the clock to come to a complete stop? In other words, when is the radial speed zero? How many times will the clock be correct between $t = 0$ and then? Note that the speed of a correct clock would be $m_{real}(t) = \frac{\pi}{30}$ radians/minute. To find how often the broken clock is correct you need to find the positions of the broken clock and the correct clock. Assume that the broken clock is correct at $t = 0$. The broken clock is VISUALLY correct when the minute and hour hands are in the same position as the correct clock. We can express this mathematically by saying that the difference between the two positions is an integer multiple of $minutes * hours * \pi/30 = 60 * 12\pi/30 = 24\pi$. Find the difference between the two position

functions at the time when the broken clock comes to a complete stop. Then divide by 24π. Round down to the nearest integer. This is the number of times the broken clock will be visually correct between $t = 0$ and the time it comes to a complete stop.

5.