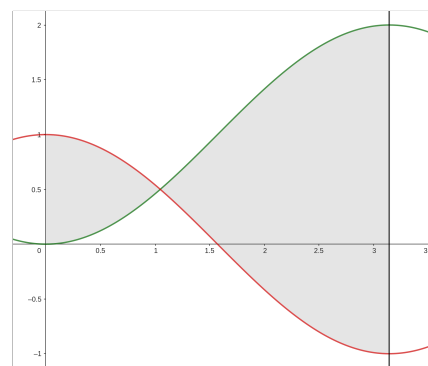Name: _____

Write all of your responses on the extra paper provided. Put your name at the top of all the pages. Show all your work, answers without supporting justification will not receive credit. **Keep your answers in exact form.**

1. (*20 points*) Find the following indefinite integrals.

   (a) $\displaystyle\int x^5\sqrt{1+x^2}\,dx$ 　　　　　　　　　(b) $\displaystyle\int \sin(x)\ln(\cos(x))\,dx$

2. (*10 points*) Find the area between the curves $y = 1 - \cos(x)$ and $y = \cos(x)$ on $0 \le x \le \pi$. Graph on the right.

3. (*10 points*) Find the volume of the solid produced by taking **just the left region** in the image to the right and rotating it about the x-axis. Use the disk and washer method.

4. (*10 points*) Find the volume of the solid produced by taking **just the left region** in the image to the right and rotating it about the y-axis. Use the shell method.

5. **Extra Credit:** (*5 points*)

   The spherical tank to the right is full of water. The tank has a radius of 3 meters and the spout at the top is 1 meter above the top of the tank. The water level is right to the top of the tank but not in the spout. Find the work required to pump the water out of the spout at the top. Remember that the density of water is 1000 kg/m^3 and the force of gravity is 9.8 m/s^2.