Name: _____ **ID:** _____

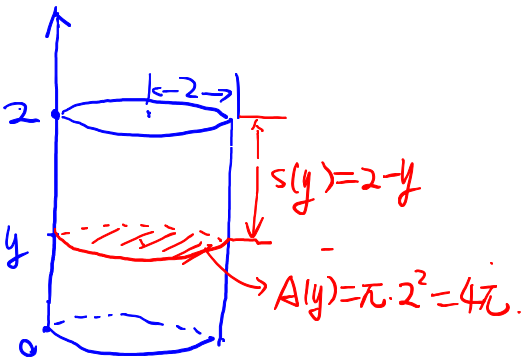
Clear your desk of everything except pens, pencils and erasers. Show all work clearly and in order. No notes, phones and calculators. You have 10 minutes to finish these **TWO** problems for 10 points.
Formula Sheet.

- Work: Suppose $f(x)$ is a force function. The work in moving an object from a to b is given by: $W = \int_a^b f(x)dx$
- If f is a one-to-one differentiable function with inverse function f^{-1} and $f'(f^{-1}(a)) \neq 0$, then the inverse function is differentiable at a and

$$(f^{-1})'(a) = \frac{1}{f'\big(f^{-1}(a)\big)}$$

1. A vertical right cylindrical tank has **height 2** ft and **radius 2** ft. It is full of soda **weighing** 60 **lbs**/ft^3. How much work does it take to pump all of the soda from a tank to an outlet which is at **the level of the top of the tank**.

   (a) (5 points) Set up the integral for the work.



$$V = \int_0^2 60\cdot(2-y)\cdot 4\pi\cdot dy$$

   (b) (2 points) Evaluate the integral.

$$V = 240\pi\cdot\int_0^2 2-y\cdot dy = 240\pi\cdot\left(2y-\frac{1}{2}y^2\right)\Big|_0^2$$

$$= 240\pi\cdot(4-2) = 480\pi \text{ ft-lb.}$$

2. (3 points) Suppose that the differentiable function $y = f(x)$ has an inverse. The graph of f **passes through the origin with slope** 4, i.e., $f(0) = 0$ and $f'(0) = 4$. Find the slope of the graph of f^{-1} **at the origin**.

$f'(0) = 4$, $f(0) = 0 \Rightarrow f^{-1}(0) = 0$

$$(f^{-1})'(0) = \frac{1}{f'(f^{-1}(0))} = \frac{1}{f'(0)} = \boxed{\frac{1}{4}}$$