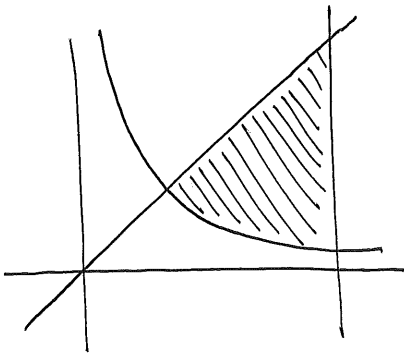
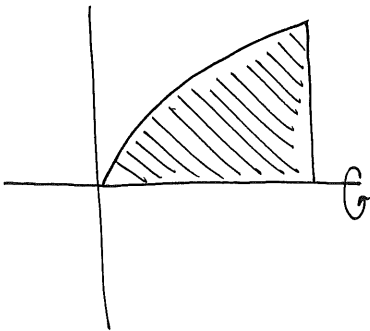


3. (15 points) Find the area of the region in the first quadrant bounded by the curves $y = x$, $y = 1/x$, and $x = 3$. Simplify your answer as much as possible.

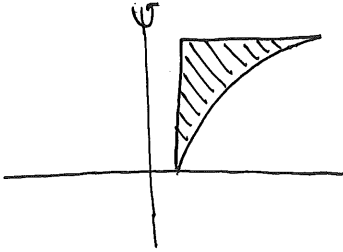


4. (15 points) Find the volume of the solid obtained by revolving the region bounded by the curve $y = x^{1/4}$ and the lines $y = 0$ and $x = 4$ about the x -axis. Simplify your answer as much as possible.

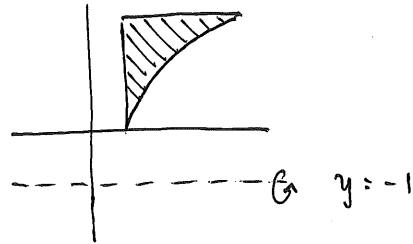


5. (15 points) Set up (**but do not evaluate**) definite integrals that give the volumes of the solids obtained by revolving the region bounded by the curves $y = \ln x$, $y = 2$, and $x = 1$ about the given axes. In each case, show a representative disk, washer, or shell on the sketch provided.

(a) the y -axis

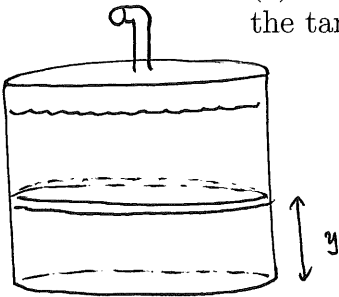


(b) the line $y = -1$



6. (15 points) A cylindrical tank of radius 8 meters and height 12 meters is filled to a height of 10 meters with water, which weighs 9800 N/m^3 . Water is to be pumped out through a spout that extends 3 meters above the tank's top.

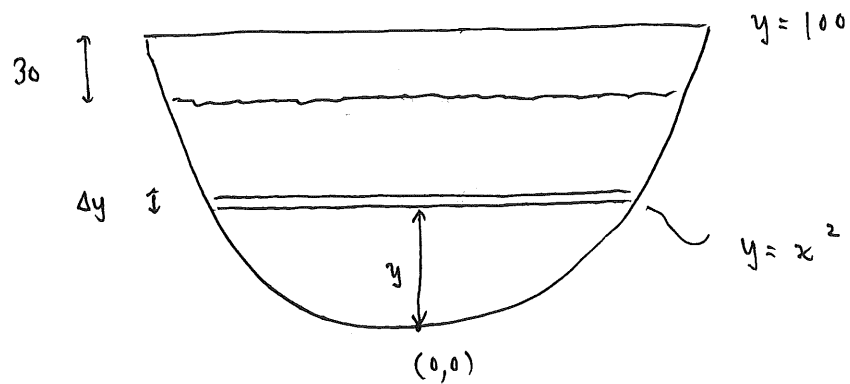
(a) Find the weight of a slice of thickness Δy located at y meters from the bottom of the tank.



(b) Find the distance moved by the slice discussed in part (a) to reach the top of the spout. Your answer should be consistent with the definition of y in the diagram.

(c) Set up (**but do not evaluate**) a definite integral that gives the total work required to empty the tank.

7. (15 points) The wall of a dam is shaped like the region above the parabola $y = x^2$ and below the line $y = 100$. Water weighs 62.4 lb/ft^3 , and the water level is 30 feet below the top of the dam.



(a) Find the area of the strip of thickness Δy located at y feet above the bottom of the dam. Your answer should be expressed in terms of the variable y , as labeled in the diagram.

(b) Find the pressure along the strip discussed in part (a).

(c) Set up (but do not evaluate) a definite integral that gives the hydrostatic force on the dam.