I. THIS IS THE ONLY SECTION WHERE YOU **WILL BE REQUIRED TO COMPUTE THE INTEGRALS**.
FOR SPRING #1, ASSUME THAT 16 JOULES OF WORK IS REQUIRED TO STRETCH THE SPRING FROM 0 METERS TO 4 METERS.
FOR SPRING #2, ASSUME THAT A FORCE OF 36 NEWTONS WILL COMPRESS THE SPRING 6 METERS.
WHICH OF THE FOLLOWING REQUIRES MORE WORK?

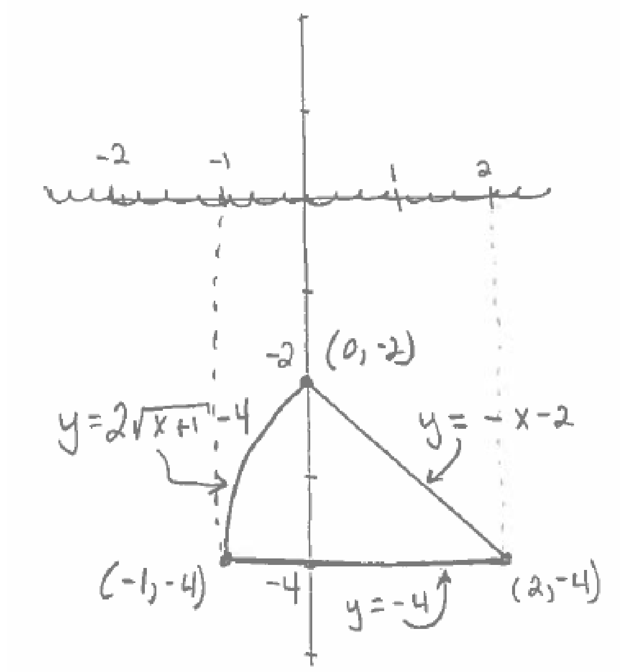
(A) STRETCHING SPRING #1 FROM 2 METERS TO 5 METERS
(B) STRETCHING SPRING #2 FROM 1 METER TO 3 METERS

FROM THIS POINT FORWARD, YOU NEED NOT EVALUATE THE INTEGRALS, SIMPLY SET THEM UP.

II. AS INDICATED IN THE PICTURE, A PLATE IS BOUNDED BY THE EQUATIONS

$$y = 2\sqrt{x+1} - 4$$
$$y = -x - 2$$
$$y = -4$$

AND IS SUBMERGED IN A FLUID WITH DENSITY CONSTANT OF ρ.
SET UP AN INTEGRAL WHICH WILL DETERMINE THE TOTAL FLUID FORCE AGAINST ONE SIDE OF THE PLATE.



III. SEE THE FIGURES. A REGION IS BOUNDED BY THE GRAPHS OF THE EQUATIONS

$y = \tan(x)$

$x = \pi/4$

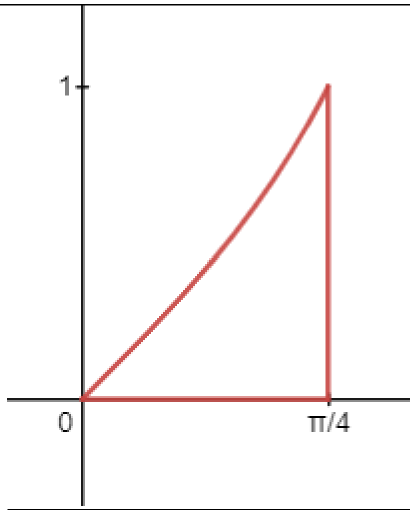
$y = 0$

SET UP AN INTEGRAL WHICH WILL COMPUTE THE VOLUME OF THE SOLID OF REVOLUTION FORMED BY REVOLVING THE REGION

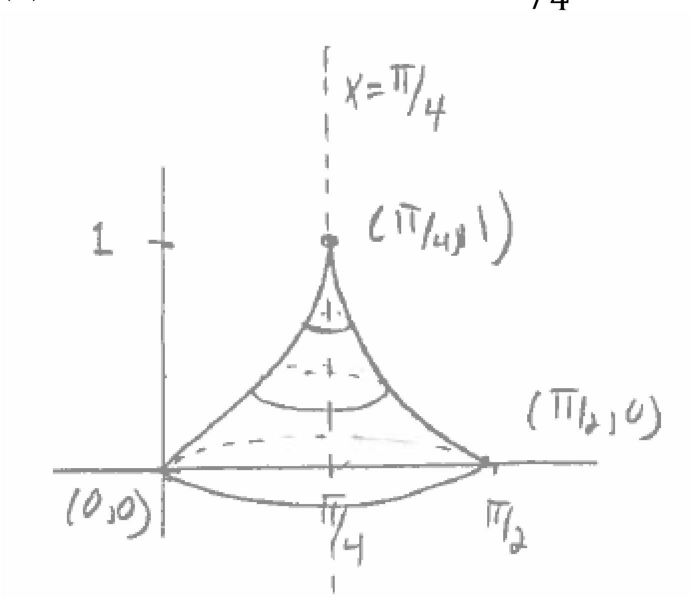
(A) ABOUT THE LINE $x = \pi/4$

(B) ABOUT THE LINE $y = -2$

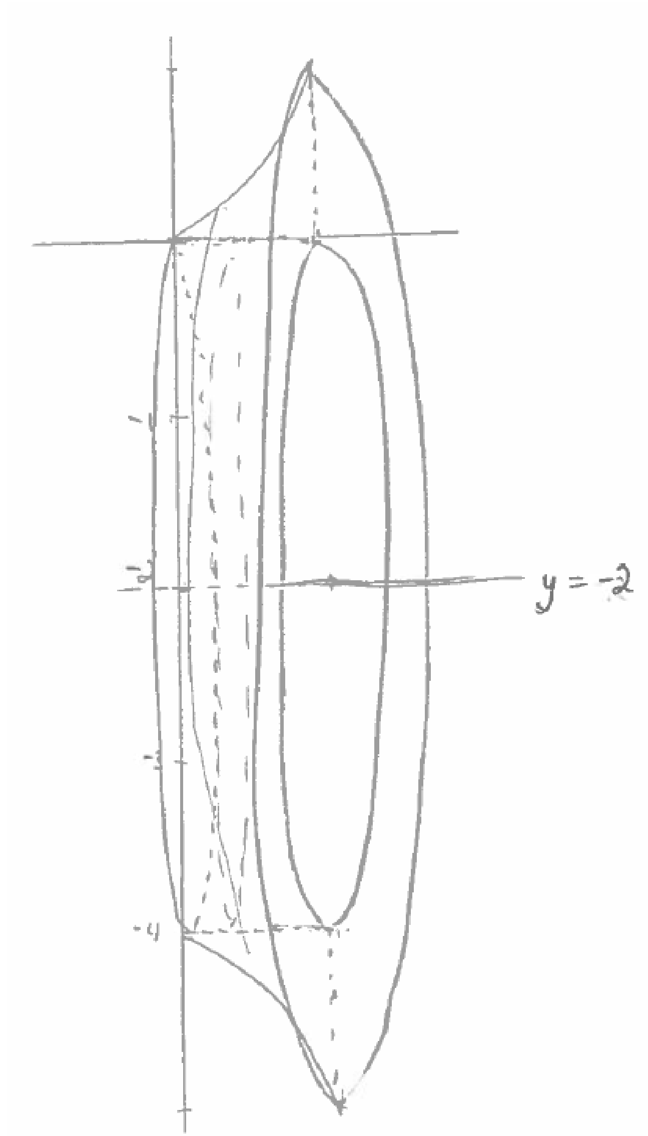
YOU MAY ELECT TO USE EITHER THE DISK/WASHER METHOD OR THE SHELL METHOD, HOWEVER, **YOU NEED TO CLEARLY STATE** WHICH METHOD YOU ARE USING.

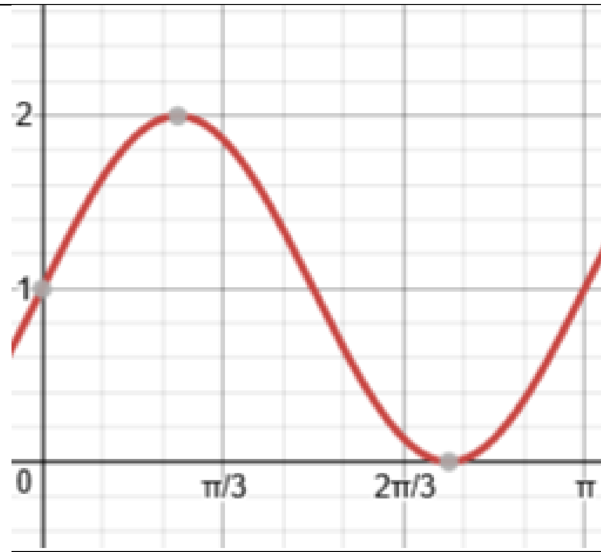


(A) REVOLVE ABOUT THE LINE $x = \pi/4$

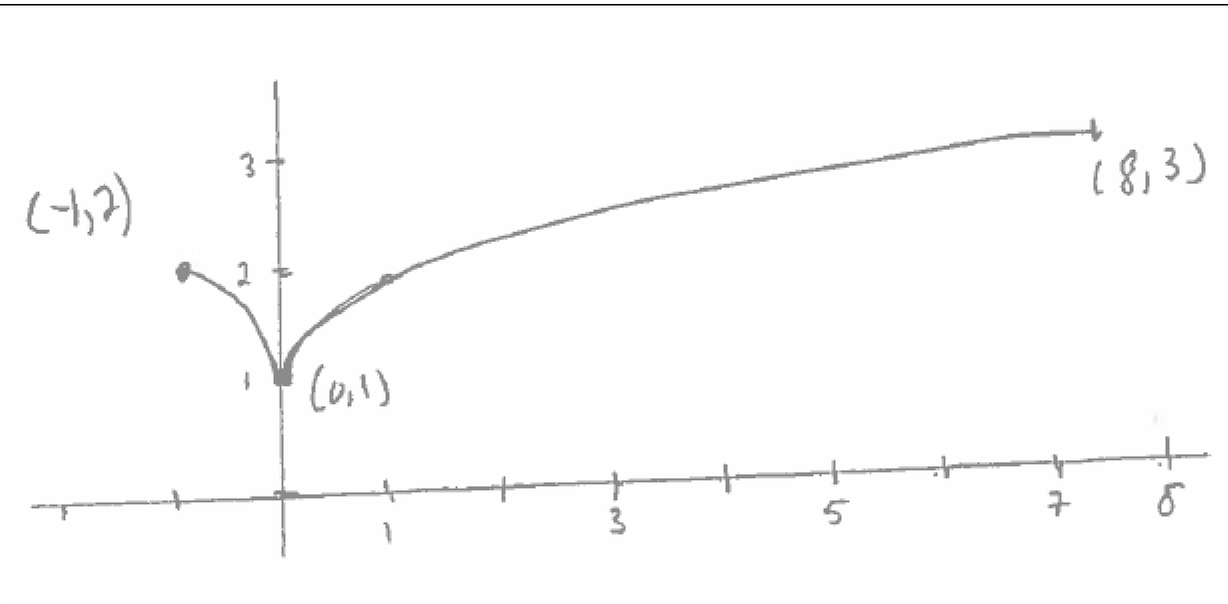


(B) REVOLVE ABOUT THE LINE $y = -2$.
NOTE THAT THE FIGURE IS HOLLOW.



IIII. SET UP AN INTEGRAL WHICH WILL FIND THE ARC LENGTH OF THE FUNCTION $y = 1 + \sin(2x)$ ON THE INTERVAL $[0, \pi]$.	

V. SET UP THE INTEGRALS REQUIRED TO FIND THE ARC LENGTH OF THE GRAPH OF $y = 1 + x^{(2/3)}$ ON THE INTERVAL $[-1,8]$. NOTE THAT THERE IS A CUSP IN THE GRAPH AT THE POINT $(0, 1)$.



VI. SEE THE FIGURES. A REGION IS BOUNDED BY THE GRAPHS OF THE EQUATIONS

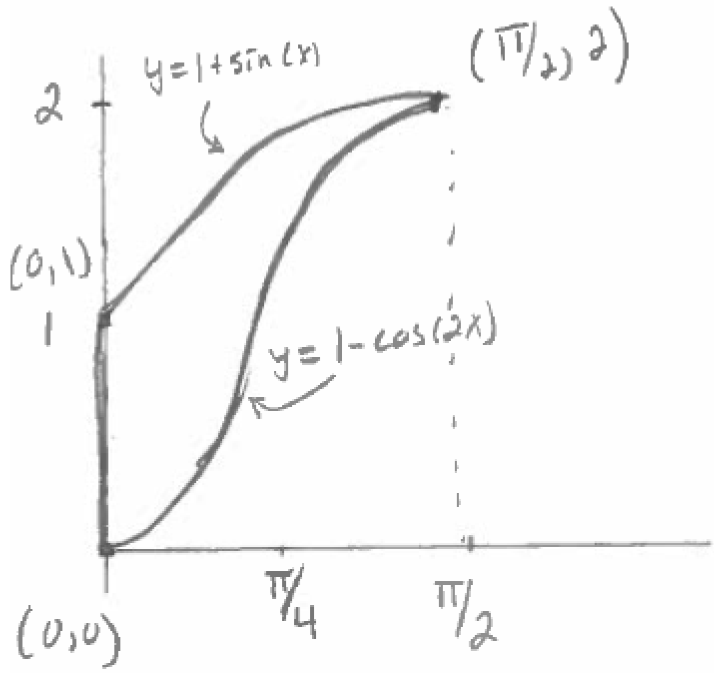
$$y = 1 + \sin(x)$$
$$y = 1 - \cos(2x)$$
$$x = 0$$

SET UP AN INTEGRAL WHICH WILL COMPUTE THE VOLUME OF THE SOLID OF REVOLUTION FORMED BY REVOLVING THE REGION

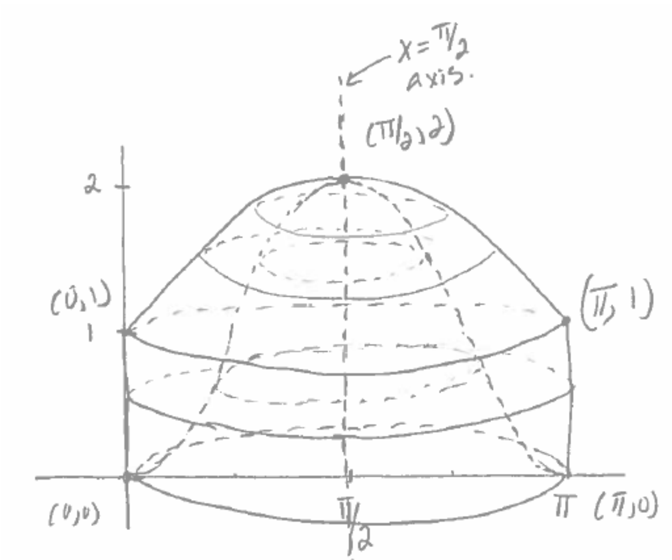
(A) ABOUT THE LINE $x = \frac{\pi}{2}$. NOTE THAT THE FIGURE IS HOLLOW.

(B) ABOUT THE LINE $y = -1$ NOTE THAT THE FIGURE IS HOLLOW

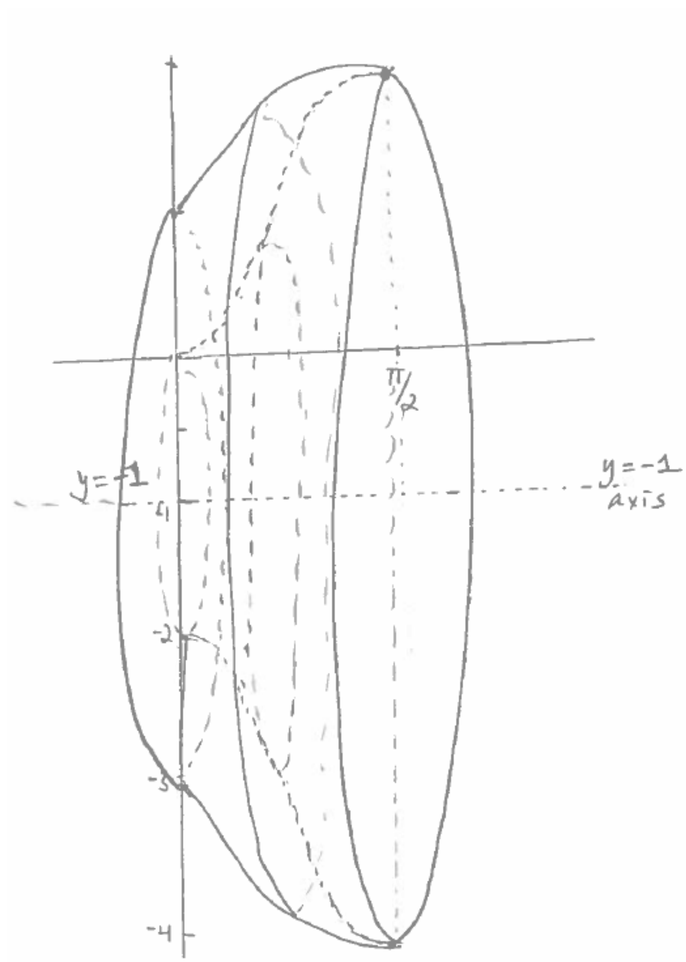
YOU MAY ELECT TO USE EITHER THE DISK/WASHER METHOD OR THE SHELL METHOD, HOWEVER, **YOU NEED TO CLEARLY STATE** WHICH METHOD YOU ARE USING.



(A) REVOLVE ABOUT THE LINE $x = \frac{\pi}{2}$.
NOTE THAT THE FIGURE IS HOLLOW.



(B) REVOLVE ABOUT THE LINE $y = -1$.
NOTE THAT THE FIGURE IS HOLLOW



VII. FOR THE REGION GIVEN IN ITEM VI ABOVE:

$y = 1 + \sin(x)$

$y = 1 - \cos(2x)$

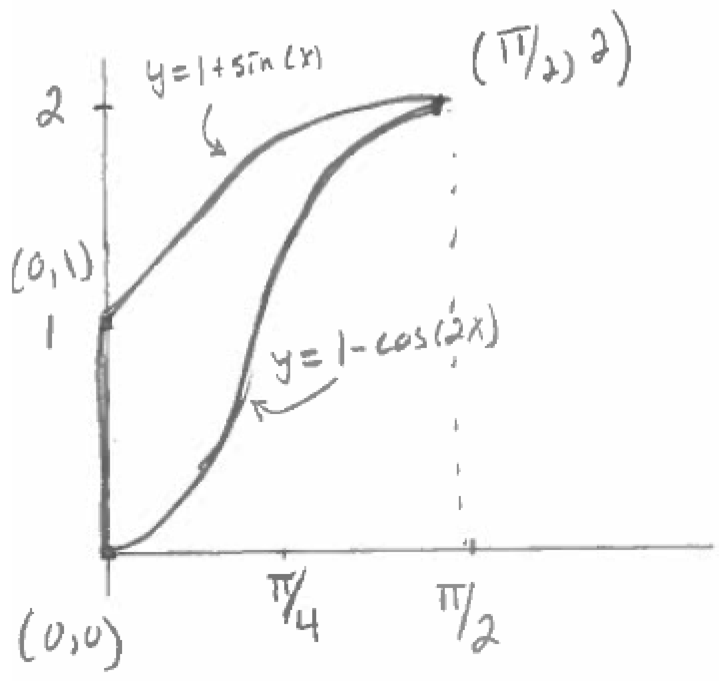
$x = 0$

SET UP ALL THE INTEGRALS REQUIRED TO COMPUTE THE CENTER OF MASS. THAT IS, SET UP INTEGRALS REQUIRED TO FIND THE MOMENTS:

M_x AND M_y,

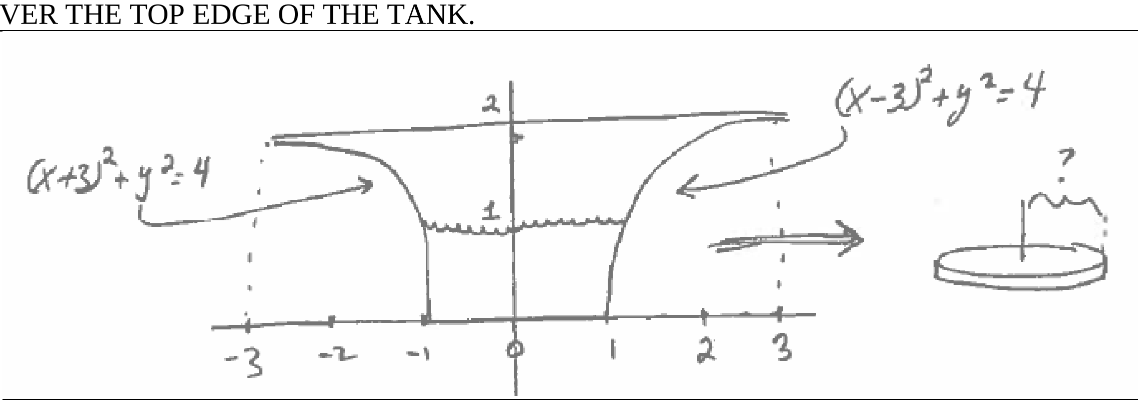
AND THE COORDINATES OF THE CENTER OF MASS:

$\bar{x}$ AND $\bar{y}$

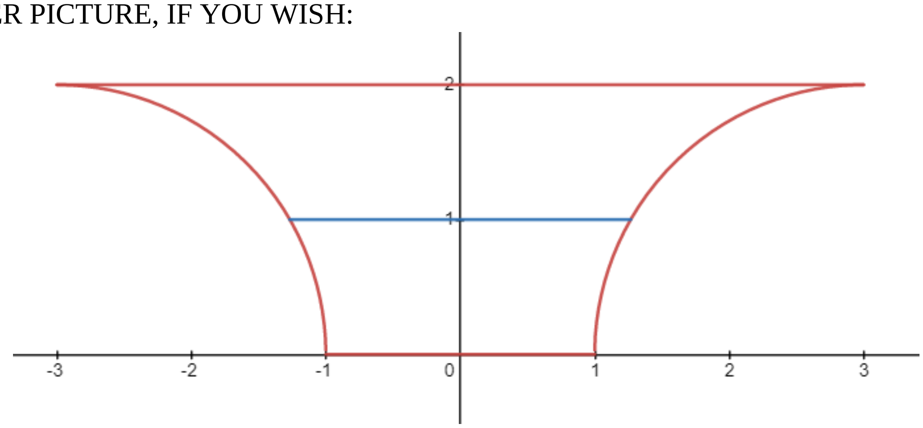


VIII. A TANK OF LIQUID WITH DENSITY CONSTANT OF ρ IS SHAPED AS PICTURED. WHEN VIEWED AS A CROSS SECTION, AS PICTURED, THE SIDES OF THE TANK ARE QUARTER-CIRCLE ARCS WITH RADIUS OF 2 METERS, AND THE EQUATIONS ARE AS INDICATED. ASSUME THE DEPTH OF THE LIQUID IS 1 METER.

SET UP AN INTEGRAL WHICH WILL COMPUTE THE WORK DONE ELEVATING AND EMPTYING THE LIQUID OVER THE TOP EDGE OF THE TANK.



PERHAPS A BETTER PICTURE, IF YOU WISH:



IX. SEE FIGURES. A REGION IS BOUNDED BY THE GRAPHS OF THE EQUATIONS

$$y = 2x - 1$$
$$y = -2x + 7$$
$$y = -2x + 11$$
$$y = 3 + (x-4)^3$$

SET UP AN INTEGRAL WHICH WILL COMPUTE THE VOLUME OF THE SOLID OF REVOLUTION FORMED BY REVOLVING THE REGION ABOUT THE y AXIS.

YOU MAY ELECT TO USE EITHER THE DISK/WASHER METHOD OR THE SHELL METHOD, HOWEVER, **YOU NEED TO CLEARLY STATE** WHICH METHOD YOU ARE USING.

ALSO, NOTICE THAT **NO MATTER WHICH** METHOD YOU SELECT, **THERE IS A CUSP** INVOLVED, SO EITHER METHOD WILL REQUIRE **TWO INTEGRALS** TO BE SET UP.