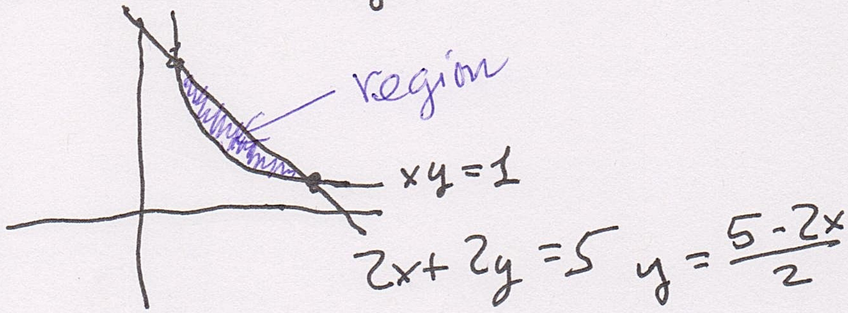
Solution to original #2



Find intersection points:

$$2x + \frac{2}{x} = 5 \Longrightarrow 2x^2 - 5x + 2 = 0$$

$$\xrightarrow[\text{Q. Formula}]{\text{(say by the}} \quad x = 2 \text{ or } \tfrac{1}{2} \qquad \left(2, \tfrac{1}{2}\right)$$

$$y = \tfrac{1}{2} \text{ or } 2. \qquad \left(\tfrac{1}{2}, 2\right)$$

So area =

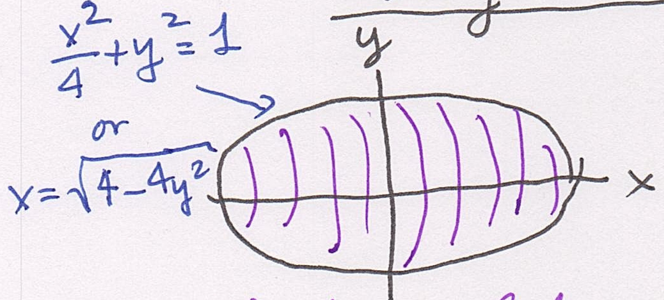
$$\int_{1/2}^{2} \left(\frac{5-2x}{2} - \frac{1}{x} \right) dx = \frac{5x}{2} - \frac{x^2}{2} - \log x \Big|_{\frac{1}{2}}^{2} =$$

$$\left(5 - 2 - \log 2\right) - \left(\frac{5}{4} - \frac{1}{8} - \log \frac{1}{2}\right) =$$

$$\cancel{\frac{15}{4} - \frac{15}{8}} \boxed{- \log 2 - \left(- \log \tfrac{1}{2}\right)} = \frac{15}{8} - \log 4$$

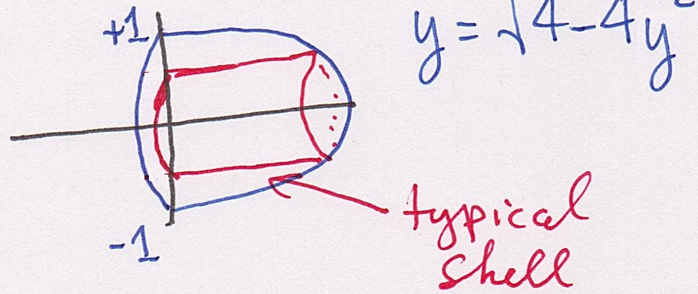
$$\frac{15}{8} \qquad -\log 2 - (\log 2) = - \log 4$$

Here is a correct REPLACEMENT solution to #2 using the Shell Method



Since we are rotating about the x-axis and not the y-axis, we need a modified volume formula with x & y switched.

Also, the shell method applies to solids with flat bottoms, here given by the plane $x=0$. To get the total volume we must find the volume V_+ of the half for which $x \geq 0$ and then multiply by 2.



So the volume V is $2V_+$, where

$$V_+ = 2\pi \int_{-1}^{1} y\,x(y)\,dy =$$

$$2\pi \int_{-1}^{1} y\sqrt{4-4y^2}\,dy.$$ We shall not evaluate the definite integral here [Hint: Let $u = 4-4y^2$.]