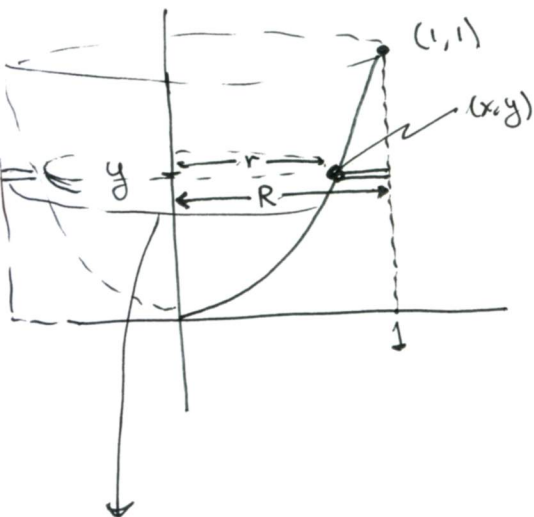


### Math 133 — Quiz 1A

Solve the problem below. Include one or two sketches, and show all your steps.

(1) (6 points) The region  $R$  under the curve  $y = x^3$  and above the  $x$ -axis and to the left of the line  $x = 1$  is revolved around the  $y$ -axis. Find the volume of the resulting solid.



Intersection pt:  $(1, 1)$

Slice  $\perp$  to  $y$ -axis,  $0 \leq y \leq 1$

limits of integration  
1 pt.

Slice at  $y$  is washer with

outer radius  $R = 1$  (1 pt)  
inner radius  $r = x$ -coordinate of pt  $(x, x^3)$   
on curve  $y = x^3$

$\Rightarrow r = \sqrt[3]{y}$ . (1 pt)

Area of slice:  $\pi(R^2 - r^2) = \pi(1 - (\sqrt[3]{y})^2)$   
 $= \pi(1 - y^{2/3})$

1 pt

Volume =  $\int_0^1 \pi(1 - y^{2/3}) dy$

$= \pi \left[ y - \frac{y^{5/3}}{5/3} \right]_0^1$

$= \pi \left[ \left(1 - \frac{3}{5}\right) - 0 \right]$

$= \frac{2\pi}{5}$

Set up and do the integral  
2 pts

Total: 6 pts.