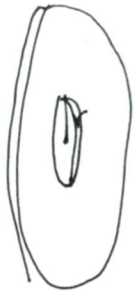
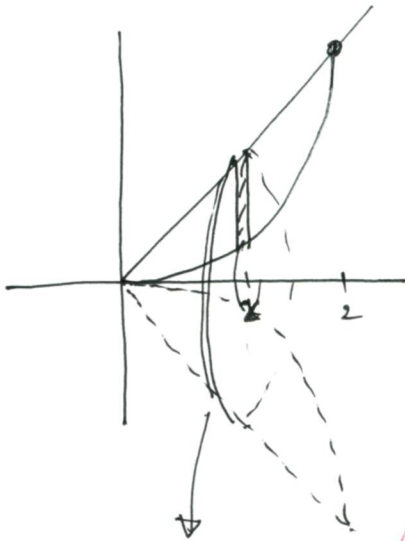


Math 133 — Quiz 1B

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

(1) (6 points) The region  $R$  below the line  $y = 2x$  and above the curve  $y = x^2$  is rotated about the  $x$ -axis. Find the volume of the resulting solid.



Intersection pt: where  $2x = x^2 \Rightarrow x = 2$

Slice  $\perp$  to  $x$ -axis.

$0 \leq x \leq 2$

limits of integration + 1 pt

Slice at  $x$  is a washer with

Outer radius  $R = y$ -coordinate of pt.  $(x, y)$

on line  $y = 2x \Rightarrow R = 2x$ .  
1 pt.

Inner radius  $r = y$ -coordinate of pt.  $(x, y)$

on curve  $y = x^2 \Rightarrow r = x^2$ .  
1 pt.

Area of slice:  $\pi(R^2 - r^2) = \pi[(2x)^2 - (x^2)^2]$   
 $= \pi[4x^2 - x^4]$ .  
1 pt.

Volume =  $\int_0^2 \pi(4x^2 - x^4) dx$ .

$= \pi \left[ \frac{4}{3}x^3 - \frac{x^5}{5} \right]_0^2$

$= \pi \left[ \frac{32}{3} - \frac{32}{5} \right]$

$= 32\pi \left[ \frac{1}{3} - \frac{1}{5} \right] = 32\pi \cdot \frac{2}{15} = \frac{64\pi}{15}$

Set up and do the integral 2 pts.

Total: 6 pts.