Handout 2

MATH 172 Lab: Sections 7 and 8

Lab Instructor (TA): Mohammed Kaabar

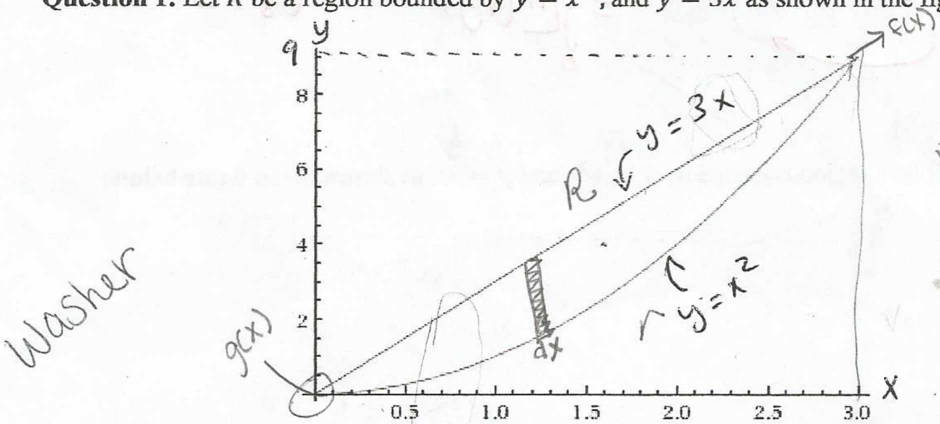
Student's Name: Alyse Bailey

Student's ID: Solution

Note: This handout covers only the volumes by slicing and shells.

Instruction: Work in groups to solve the following mathematical problems, and I want from each group one person to volunteer as a representative to present the solution of (one problem)/(one part of problem) on our class board. <u>DON'T AFRAID TO MAKE MISTAKES BECAUSE WE LEARN FROM OUR MISTAKES!</u>

Question 1: Let R be a region bounded by $y = x^2$, and $y = 3x$ as shown in the figure below:



$y = 3x = f(x) = R$

$y = x^2 = g(x) = r$

$3x = x^2$

$x^2 - 3x = 0$

$x(x-3)$

$\boxed{x=0 \quad x=3}$ Boundaries

Find the volume of the above region generated by revolving R about the $x-axis$.

$3 \cdot 3 = 9 \cdot 3 = 27$ $\quad 81 \cdot 3$ $\quad 81 \times 3 = 243$

Solution

$V = \int_0^3 \pi(3x)^2\,dx - \int_0^3 \pi(x^2)^2\,dx$

$\pi \int_0^3 9x^2\,dx - \pi\int_0^3 x^4\,dx$

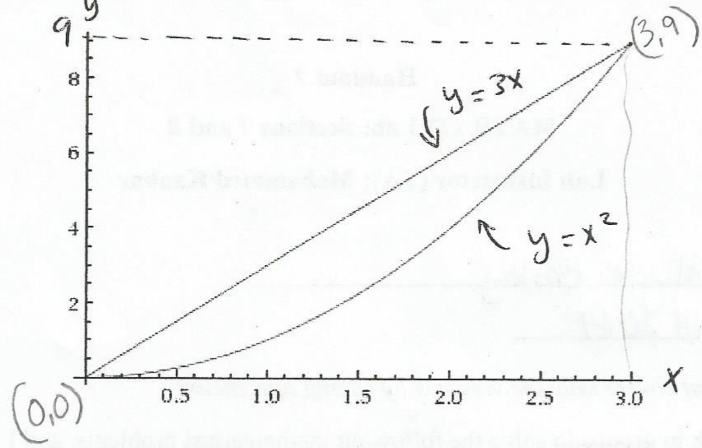
$\pi[3x^3]_0^3 - \pi\left[\frac{x^5}{5}\right]_0^3$

$\pi[3(3)^3] - \pi\left[\frac{3^5}{5}\right]$

$81\pi - \frac{243\pi}{5}$

$\boxed{\frac{162\pi}{5}}$

Question 2: Let R be a region bounded by $y = x^2$, and $y = 3x$ as shown in the figure below:



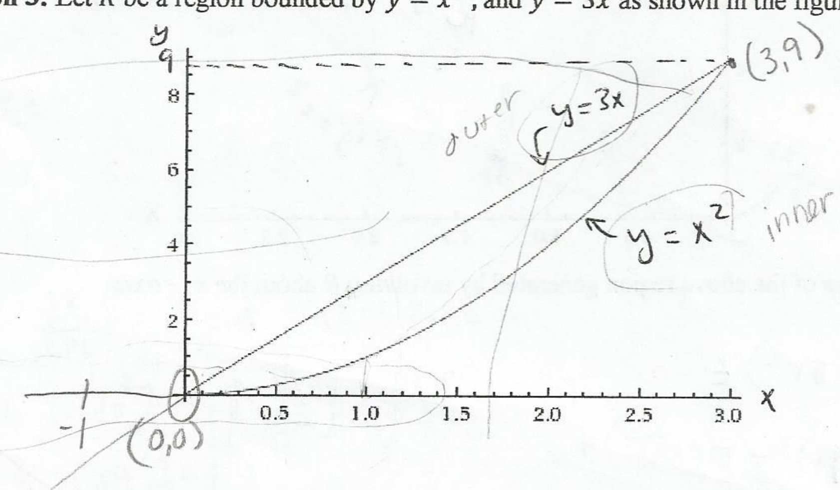
SET UP ONLY (DO NOT EVALUATE) an integral that represents the volume of the above region generated by revolving R about $y - axis$.

$$V = \int_0^9 \pi\left(\frac{y}{3}\right)^2 - \pi(\sqrt{y})^2\,dy = \int_0^9 \left[\pi(\sqrt{y})^2 - \pi\left(\frac{y}{3}\right)^2\right] dy$$

$\sqrt{y = x^2}$ $x = \sqrt{y}$ $\frac{y}{3} = \frac{3x}{3}$ $\frac{y}{3} = x$

$x = \sqrt{y}$ $x = \frac{y}{3}$

Question 3: Let R be a region bounded by $y = x^2$, and $y = 3x$ as shown in the figure below:



SET UP ONLY (DO NOT EVALUATE) an integral that represents the volume of the above region generated by revolving R about $\boxed{x = -1}$

$V = \int_a^b 2\pi(x + d)(f(x) - g(x))\,dx$

bounded by $x = 0$ and $x = 3$ $[0, 3]$

$a = 0$ $b = 3$

$$V = \int_0^3 2\pi(x+1)(3x - x^2)\,dx$$

$$2\pi \int_0^3 (3x^2 - x^3 + 3x - x^2)\,dx$$

$$2\pi \int_0^3 (-x^3 + 2x^2 + 3x)\,dx$$