CSD2201/CSD2200 Week 9 Tutorial Problems

23rd October – 29th October 2023

It is recommended to treat the attempt of these problems seriously, even though they are not graded. You may refer to the lecture slides if you are unsure of any concepts.

After attempting each problem, think about what you have learnt from the attempt as a means of consolidating what you have learnt.

Tip: As a way to check your final answer, you can, for part (b) and (c) of each question, with the exception of Question 7, use both the cross-sectional method and the cylindrical shells method. It will be very tedious in some cases, but it will help you gain the experience needed to detect which method would be more efficient.

Question 1

The region R is enclosed by the curves $y = x$ and $x = y^2$.

(a) Sketch the region R.
(b) Find the volume of the solid obtained by rotating R about the x-axis.
(c) Find the volume of the solid obtained by rotating R about the y-axis.

Question 2

The region R is enclosed by the curves $x = \sqrt{5}y^2$, $y = 1$ and $x = 0$.

(a) Sketch the region R.
(b) Find the volume of the solid obtained by rotating R about the x-axis.
(c) Find the volume of the solid obtained by rotating R about the y-axis.

Question 3

The region R is enclosed by the curves $y = x^3$, $y = 8$ and $x = 0$.

(a) Sketch the region R.
(b) Find the volume of the solid obtained by rotating R about the x-axis.
(c) Find the volume of the solid obtained by rotating R about the y-axis.

Question 4

The region R is enclosed by the curves $x = 2\sqrt{y}$, $y = 9$ and $x = 0$.

(a) Sketch the region R.
(b) Find the volume of the solid obtained by rotating R about the x-axis.
(c) Find the volume of the solid obtained by rotating R about the y-axis.

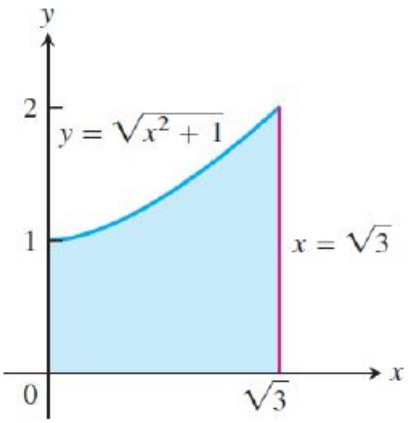
Question 5

The region R is enclosed by the curves $y = \dfrac{1}{x}$, $y = 0$, $x = 1$ and $x = 4$.

(a) Sketch the region R.
(b) Find the volume of the solid obtained by rotating R about the x-axis.
(c) Find the volume of the solid obtained by rotating R about the y-axis.

Question 6

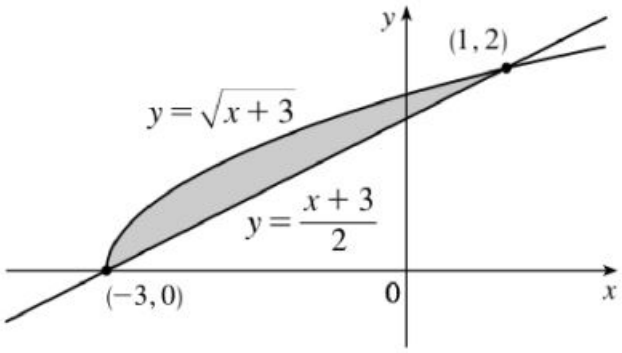
Let R be the shaded region in the figure below.



(a) Find the volume of the solid obtained by rotating R about the x-axis.
(b) Find the volume of the solid obtained by rotating R about the y-axis.

Question 7

Let R be the shaded region in the figure below.



Find the volume of the solid obtained by rotating R about the x-axis.

Final Answers:

Q1: (b) $\frac{\pi}{6}$, (c) $\frac{2\pi}{15}$.

Q2: (b) $\frac{\sqrt{5}\pi}{2}$, (c) π.

Q3: (b) $\frac{768\pi}{7}$, (c) $\frac{96\pi}{5}$.

Q4: (b) $\frac{1944\pi}{5}$, (c) 162π.

Q5: (b) $\frac{3\pi}{4}$, (c) 6π.

Q6: (a) $2\sqrt{3}\pi$, (b) $\frac{14\pi}{3}$.

Q7: $\frac{8\pi}{3}$.