

MATH 1700 Assignment 2

The values for each question are in brackets to the left of each question.

1. [8] a) Find the volume of the solid formed when the region bounded by the curves $y = x^3$, $y = 1$, and $x = 0$ is rotated about the y -axis.

b) [8] Find the volume of the solid formed when the region bounded by the curves $y = \frac{1}{x}$, x -axis, $x = 1$ and $x = 3$ is rotated about $y = -1$.

For a) and b) use both **shell** and **washer** method and EVALUATE THE INTEGRAL.

2. [3] Find the volume of the solid formed when the region bounded by the curves $y = e^x$, $y = e^{-2x}$ and the line $x = 4$ is rotated about the line $x = 4$. DO NOT EVALUATE THIS INTEGRAL.

3. [3] Set up an integral giving the volume of the solid obtained by rotating the region bounded by curves $y = \sqrt{x}$ and $y = x^2$ about the line $y = 0$. DO NOT EVALUATE THIS INTEGRAL.

4. [4] Let \mathcal{R} be the region bounded by the curves $y = 2 \sin x$, $y = 2$ and y -axis.

a) Set up, but DO NOT EVALUATE, an integral for the area of \mathcal{R} .

b) Set up, but DO NOT EVALUATE, an integral for the volume of the solid generated by rotating \mathcal{R} about the x -axis (respectively the y -axis).

c) Set up, but DO NOT EVALUATE, an integral for the volume of the solid generated by rotating \mathcal{R} about the line $x = \frac{\pi}{2}$.

5. Find the following integrals:

[3] (a) $\int_0^1 xe^x dx$

[3] (b) $\int_{-1}^1 |x| e^x dx$ where $|x|$ is the absolute value of x .

[4] (c) $\int_0^1 \arcsin x dx$.

[3] (d) $\int_1^e x^2 \ln x dx$.

[3] (e) $\int \sqrt{\sin x} \cos^3 x dx$

[4] (f) $\int (\tan x + \tan^3 x) dx$

[3] (g) $\int \sin^3 x \cos^2 x dx$

[4] (h) $\int \cos 7x \cos 5x dx$

[4] (i) Prove the reduction formula

$$\int \cos^n x dx = \frac{1}{n} \cos^{n-1} x \sin x + \frac{n-1}{n} \int \cos^{n-2} x dx$$

where $n \geq 2$ is an integer.

[3] 6. Find the **average value** of the function $g(x) = \sqrt{x}$ over the interval $[0, 4]$.

Total value of all questions is 60 marks.