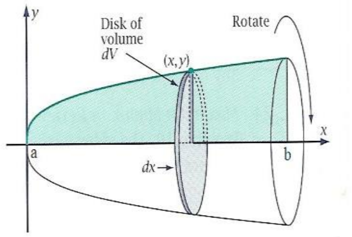
Week 15/16
Term 2
2020

HAWKER COLLEGE

Engage | Inspire | Achieve

Learning Brief:
SMM3
Integrals

Goals



By the end of this fortnight, you should be able to:

- rotate simple areas around the x-axis and the y-axis to find the volumes of solids of revolution
- understand the methods of finding volumes of solids of revolution
- develop the skills of drawing and labelling diagrams
- find the volume of revolution about the x-axis for the function f(x) from x = a to x = b
- find the volume of revolution about the y-axis for the function f(y) from y = a to y = b
- find the volume of revolution about the x-axis for the region between f(x) and g(x) where f(x) ≥ g(x) from x = a to x = b

Work on the Assignment. Due date now Sunday 31 May 11:59pm

Theoretical Components

References:
Cambridge Unit 3 Chapter11
Jacplus eBook *Year 12 Maths Quest Specialist* Chapter 6 Section 6G

VOLUMES OF SOLIDS OF REVOLUTION

Videos: Watch them if you need further explanation for area rotated around an axis to find the volume of a solid of revolution

http://www.youtube.com/watch?v=R_aqSL-q6_8

http://www.youtube.com/watch?v=iUzfsUOl3-A

Method 1 (Disc Method) used for Q4 (c)

https://www.youtube.com/watch?v=F2psxMnGdUw

Method 2 (Shell Method) used for Q4 (c)

https://youtu.be/6Ozz3J-LRrY

https://youtu.be/5ZGCqKAl_CA

Practical Components

Week 15

- Complete mathspace.co task issued last week:

https://mathspace.co/student/tasks/SubtopicCustomTask-707163/

- Derive the volume of a cone using calculus – see activity on the next page.

Week 16

JacPlus eBook *Year 12 Maths Quest Specialist* (orange book) Chapter 6

- Exercise 6G

The six questions from the last brief appear in this exercise.

Investigation

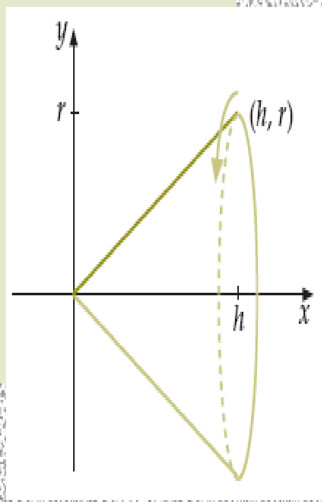
Week 15

Work on your assignment. Due date has been changed to Sunday 31 May 11:59pm.

Week 16

Derive the volume of a sphere using calculus – see activity on the next page. Show full working.

The diagram shows how a cone can be formed by rotating, about the x-axis, the line segment joining $(0, 0)$ and (h, r):

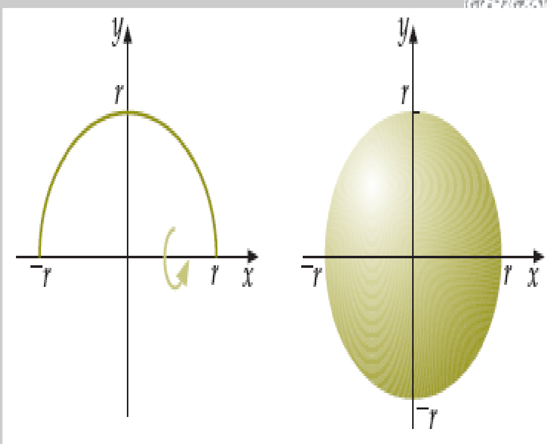


1 What is the gradient of this line segment?

2 Write down its equation.

3 Use the result $V = \pi\int_a^b [f(x)]^2\,dx$ between the limits h and 0 to obtain a formula for the volume of this cone.

When a semi-circle is rotated around the x-axis it traces out a sphere.



4 The equation of the full circle is $x^2 + y^2 = r^2$. By making y the subject, write down the function that gives the semi-circle above the x-axis.

5 The definite integral

$$V = \pi\int_{-r}^{r}\left(\sqrt{r^2 - x^2}\right)^2\,dx$$ gives the volume when the semi-circle is rotated around the x-axis. Rewrite this integral in a simpler form by expanding the expression inside the integral sign.

6 Explain why, in this case, $\pi\int_{-r}^{r}[f(x)]^2\,dx = 2\pi\int_0^r [f(x)]^2\,dx$

7 Hence, write down full working to show that the volume of a sphere of radius r is $V = \frac{4}{3}\pi r^3$.