THE RIVERS SECONDARY COLLEGE
The heart of secondary education for Lismore

Assessment Task Notification

RICHMOND RIVER HIGH CAMPUS

Task Number	2	**Task Name**	Reference Notes Test
Course	Mathematics Advanced	**Faculty**	Mathematics
Teacher	Mr Prince	**Head Teacher**	Mrs Humphrys
Issue date	Term 1, Week 7	**Due date**	Thursday 3.04.25 (In Class)
Focus (Topic)	Calculus & Graphing Techniques	**Task Weighting**	25%

Outcomes

MA12-1	A student uses detailed algebraic and graphical techniques to critically construct, model and evaluate arguments in a range of familiar and unfamiliar contexts
MA12-9	A student chooses and uses appropriate technology effectively in a range of contexts, models and applies critical thinking to recognise appropriate times for such use
MA12-10	A student constructs arguments to prove and justify results and provides reasoning to support conclusions which are appropriate to the context

MA12-3	A student applies calculus techniques to model and solve problems
MA12-6	A student applies appropriate differentiation methods to solve problems
MA12-7	applies the concepts and techniques of indefinite and definite integrals in the solution of problems
MA12-9	A student chooses and uses appropriate technology effectively in a range of contexts, models and applies critical thinking to recognise appropriate times for such use
MA12-10	A student constructs arguments to prove and justify results and provides reasoning to support conclusions which are appropriate to the context

Task description

Reference Notes Test - any hand written reference in the students own hand may be used in the exam.
Multiple choice questions. Extended response questions require fully working to be shown.

Marking Guidelines

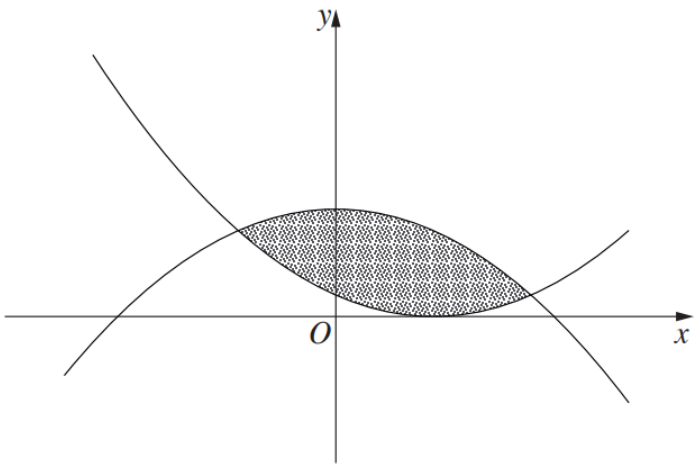
ASSESSMENT CRITERIA: Students will be assessed on their ability to create fully worked solutions using the notation and methodology referred to during the course. See attached PRACTICE TEST - Use the links to explore content and worked solutions

1. Reverse Chain Rule Application
Maths ADV HSC 2024
Q5

$$\int (6x+1)^3 dx =$$

2. Integration involving Trig functions
2024 Maths ADV HSC Q14

The curves $y = (x-1)^2$ and $y = 5 - x^2$ intersect at two points, as shown in the diagram.



NOT TO SCALE

(a) Find the x-coordinates of the points of intersection of the two curves. **1**

(b) Find the area enclosed by the two curves. **3**

Integration involving Trig functions
2024 Maths ADV HSC Q27

Question 27 (5 marks)

(a) Find the derivative of $x^2 \tan x$. **2**

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(b) Hence, find $\int (x \tan x + 1)^2 dx$. **3**

3.

Integation Involving Logs

2022 Maths ADV HSC Q 6

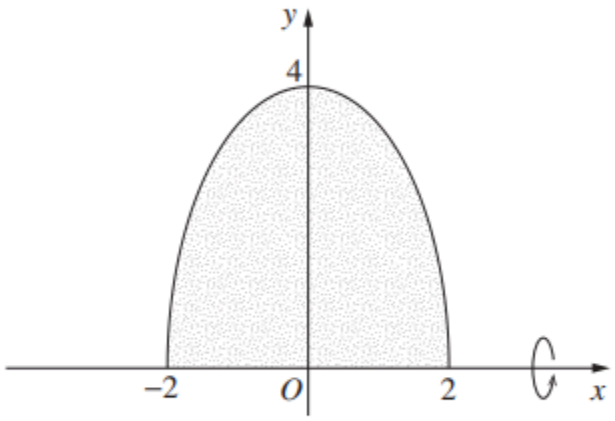
What is $\int \frac{1}{(2x+1)^2}\,dx$?

4.

Volumes of Revolution

2017 Maths ADV HSC Q12(b)

The diagram shows the region bounded by $y = \sqrt{16-4x^2}$ and the x-axis. **3**



The region is rotated about the x-axis to form a solid.

Find the exact volume of the solid formed.

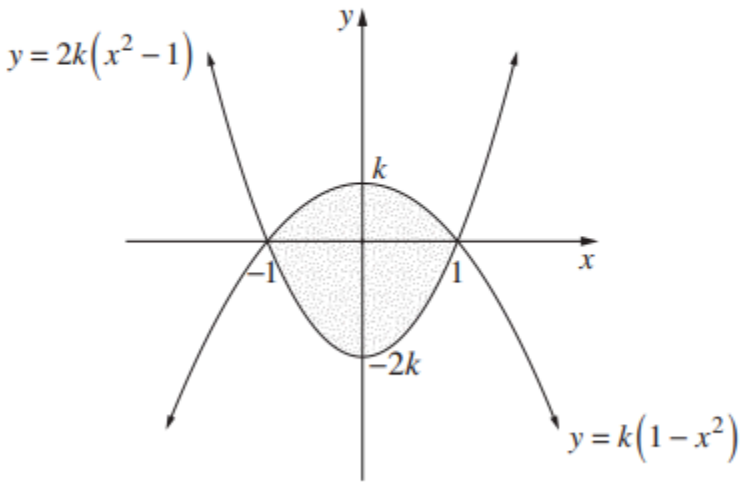
5. Trapezoidal Rule
2022 Maths ADV HSC q13

Use two applications of the trapezoidal rule to find an approximate value of $\int_0^2 \sqrt{1+x^2}\,dx$. Give your answer correct to 2 decimal places. **2**

6. Areas bounded by curves
2017 Maths ADV HSC 14(d)

The shaded region shown is enclosed by two parabolas, each with x-intercepts at $x=-1$ and $x=1$. **3**

The parabolas have equations $y=2k\left(x^2-1\right)$ and $y=k\left(1-x^2\right)$, where $k>0$.



Given that the area of the shaded region is 8, find the value of k.

7. Transformation of functions
2021 Maths ADV HSC Q 28(b)

A new function $g(x)$ is found by taking the graph of $y = -f(-x)$ and translating it by 5 units to the right. **2**

Sketch the graph of $y = g(x)$ showing the x-intercept and the asymptote.

8. Curve Sketching
2024 Maths ADV HSC q19

Sketch the curve $y = x^4 - 2x^3 + 2$ by first finding all stationary points, checking their nature, and finding the points of inflection. **5**

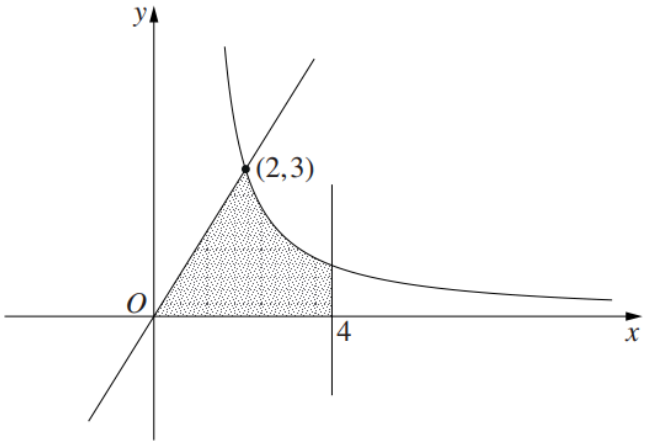
9.

Area bounded by Curves

2021 Maths ADV HSC q24

The curve $y = \dfrac{3}{x-1}$ intersects the line $y = \dfrac{3}{2}x$ at the point $(2,3)$. **3**

The region bounded by the curve $y = \dfrac{3}{x-1}$, the line $y = \dfrac{3}{2}x$, the x-axis and the line $x = 4$ is shaded in the diagram.



Find the exact area of the shaded region.

10

Finding Domain & Range of a function

2017 Maths ADV HSC q11 (h)

Find the domain of the function $f(x) = \sqrt{3-x}$. **2**

Roots & Coefficients

11. 2024 Maths ADV HSC q29

Consider the curve $y = ax^2 + bx + c$, where $a \neq 0$. **4**

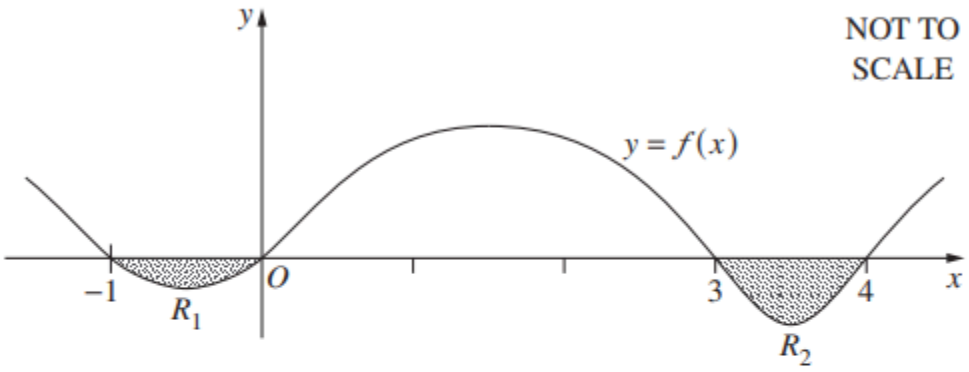
At a particular point, the tangent and normal to the curve are given by $t(x) = 2x + 3$ and $n(x) = -\frac{1}{2}x - 2$ respectively.

The curve has a minimum turning point at $x = -4$.

Find the values of a, b and c.

12 Integrate with respect to x-axis
2018 Maths ADV HSC q5

The diagram shows the graph of $y = f(x)$ with intercepts at $x = -1$, 0, 3 and 4.



The area of shaded region R_1 is 2.

The area of shaded region R_2 is 3.

It is given that $\int_0^4 f(x)dx = 10$.

What is the value of $\int_{-1}^3 f(x)dx$?

13

Odd, Even or Neither - Functions

2021 Maths ADV HSC q9

Let $h(x) = f(g(x))$ where the function $f(x)$ is an odd function and the function $g(x)$ is an even function.

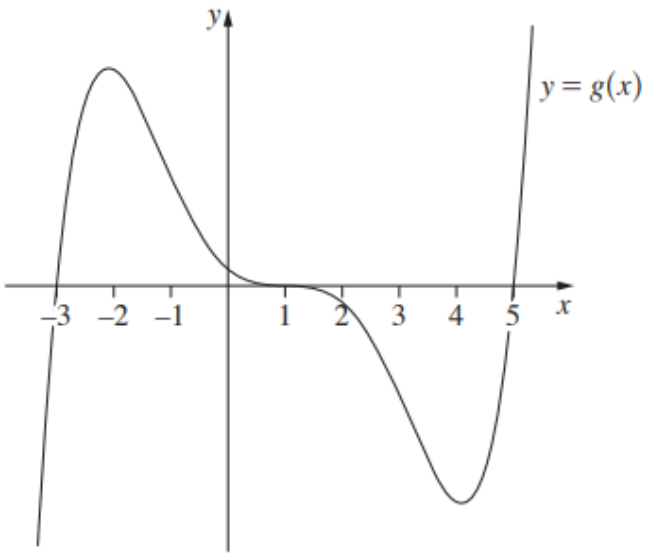
The tangent to $y = h(x)$ at $x = k$, where $k > 0$, has the equation $y = mx + c$.

What is the equation of the tangent to $y = h(x)$ at $x = -k$?

14

The sign of a derrivative
2024 Maths ADV HSC q11

The graph of the function $g(x)$ is shown. **3**



Using the graph, complete the table with the words *positive*, *zero* or *negative* as appropriate.

x-value	*First derivative of* $g(x)$ *at* x	*Second derivative of* $g(x)$ *at* x
$x = -3$		
$x = 1$		
$x = 5$		

Composite function and their derrivative
2022 Maths ADV HSC q5

Let $h(x) = \dfrac{f(x)}{g(x)}$, where

$f(1) = 2$ $\quad$ $f'(1) = 4$

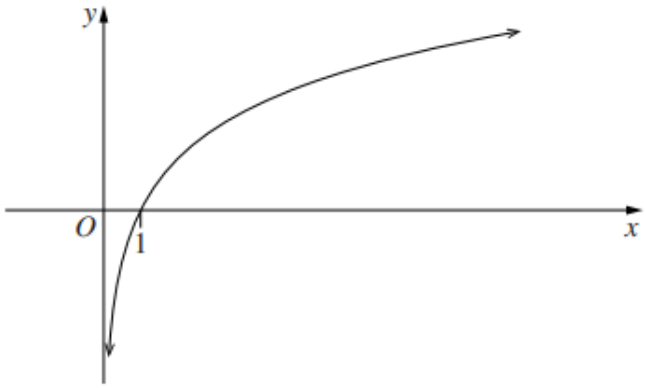
$g(1) = 8$ $\quad$ $g'(1) = 12.$

What is the gradient of the tangent to the graph of $y = h(x)$ at $x = 1$?

Logarithms

15 2020 Maths ADV HSC q29

The diagram shows the graph of $y = c\ln x,\ c > 0$.



(a) Show that the equation of the tangent to $y = c\ln x$ at $x = p$, where $p > 0$, is **2**

$$y = \frac{c}{p}x - c + c\ln p.$$

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(b) Find the value of c such that the tangent from part (a) has a gradient of 1 and passes through the origin. **2**