Pendle Hill High School

Assessment Task Cover Sheet

Faculty/Subject:	Mathematics Advanced	**Assessment Task No:**	1
Year:	12 (HSC year)	**Assessment weighting:**	20%
Date Given:	18th of November, 2019	**Due date and time:**	2nd of December 2019, Period 1
Student name:		**Teacher:**	Mr Doran

Submission Instructions

- The task must be completed by the due date. Hard copies must be handed to your regular classroom teacher during school hours and signed for.
- Email submissions must be sent to the following email account:
- Assignments received after **3:15pm** on the due date will be classed as a late submission, unless an alternate time is stated on the assessment cover sheet.
- Students must attend school and all scheduled classes on the due date of the assessment. See assessment handbook for details.

Absence/Late Submission

Late submission:

- For students in Years 11 and 12, the penalty is zero for work submitted after the due date and time. An immediate N award warning letter will be mailed to parents.
- For students in Years 7, 8, 9 and 10 the penalty is 20% of total mark per day (not marks scored). The penalty includes weekend and public holidays. This will result in an N award warning letter being mailed to parents for Year 9 and 10 students.

Absence:

- **Year 11 -12** - you are required to complete and submit to the front office an **Assessment Appeal form** within 48 hours of returning to school.
- **Year 7 -10 -** if you are absent from school on the day the task is to be completed, you are required on your return to school to provide a medical certificate or other documentation to the front office and your class teacher.
- Failure to provide adequate documentation will result in late submission penalties being applied.

Student Confirmation - please tick

□ This is all my own work. I have referenced any work used from other sources and have not plagiarised the work of others. I understand that plagiarised work will receive zero marks and an N award warning letter.

□ I have attached a complete bibliography - where appropriate.

□ I have kept a copy of my assignment.

Student Signature: ______________________________

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Assessment Task Receipt

Students are to complete before handing in. Teacher signs the receipt that must be kept by the student.

Student Name: ______________________________ Subject: ______________________

Task No : ____________ Due Date: ____/____/____ Date submitted: ____/____/____

Student Signature: ______________________ Teacher Signature: ______________________

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HSC Mathematics Advanced
Assessment Task – 2019/20

Task No: 1 **Date:** 2nd of December 2019

Weighting: 20% **Time:** Period 1 (50 mins)

Topics to be examined:

- *A Formula Sheet will be supplied in this task*
- *Calculators are permitted in this task. No other materials such as class notes, textbooks or reference material are permitted*
- *Please refer to the assessment handbook outlining what to do if you are unable to sit the task – this document includes possible consequences.*
- *If you are absent from this task for whatever reason then you are to contact Mr Doran (Acting HT Mathematics) on 9631 9651 on the morning of the assessment task*

The Task: In class Topic Test on Chapters 2, 3 & 4.

You may bring in **one** A4 (or less) page of **hand written** notes to assist you in this task.

Assessment Criteria

The task will be assessed according to your ability to answer questions on the following content:

Topic: Functions	
MA-F2 Graphing Techniques	
Students:	
• apply transformations to sketch functions of the form $y = kf(a(x + b)) + c$, where $f(x)$ is a polynomial, reciprocal, absolute value, exponential or logarithmic function and a, b, c and k are constants – examine translations and the graphs of $y = f(x) + c$ and $y = f(x + b)$ using technology – examine dilations and the graphs of $y = kf(x)$ and $y = f(ax)$ using technology – recognise that the order in which transformations are applied is important in the construction of the resulting function or graph	
• use graphical methods with supporting algebraic working to solve a variety of practical problems involving any of the functions within the scope of this syllabus, in both real-life and abstract contexts – select and use an appropriate method to graph a given function, including finding intercepts, considering the sign of $f(x)$ and using symmetry – determine asymptotes and discontinuities where appropriate (vertical and horizontal asymptotes only) – determine the number of solutions of an equation by considering appropriate graphs – solve linear and quadratic inequalities by sketching appropriate graphs	
MA-T3 Trigonometric Functions and Graphs	
Students:	

● examine and apply transformations to sketch functions of the form $y = kf(a(x + b)) + c$, where a, b, c and k are constants, in a variety of contexts, where $f(x)$ is one of sin x, cos x or tan x, stating the domain and range when appropriate – use technology or otherwise to examine the effect on the graphs of changing the amplitude (where appropriate), $y = kf(x)$, the period, $y = f(ax)$, the phase, $y = f(x + b)$, and the vertical shift, $y = f(x) + c$ – use k, a, b, c to describe transformational shifts and sketch graphs	
● solve trigonometric equations involving functions of the form $kf(a(x + b)) + c$, using technology or otherwise, within a specified domain	
● use trigonometric functions of the form $kf(a(x + b)) + c$ to model and/or solve practical problems involving periodic phenomena	
Topic: Calculus	
MA-C2 Differential Calculus	
C2.1: Differentiation of trigonometric, exponential and logarithmic functions Students:	
● establish the formulae $\frac{d}{dx}(\sin x) = \cos x$ and $\frac{d}{dx}(\cos x) = -\sin x$ by numerical estimations of the limits and informal proofs based on geometric constructions	
calculate derivatives of trigonometric functions	
establish and use the formula $$\frac{d}{dx}(a^x) = (\ln a)\, a^x$$ – using graphing software or otherwise, sketch and explore the gradient function for a given exponential function, recognise it as another exponential function and hence determine the relationship between exponential functions and their derivatives	
calculate the derivative of the natural logarithm function $\frac{d}{dx}(\ln x) = \frac{1}{x}$	
establish and use the formula $\frac{d}{dx}(\log_a x) = 1/(x \ln a)$	
C2.2: Rules of differentiation	
apply the product, quotient and chain rules to differentiate functions of the form $f(x)g(x)$, $\frac{f(x)}{g(x)}$ and $f(g(x))$ where *f(x)* and *g(x)* are any of the functions covered in the scope of this syllabus, for example, xe^x, $x \sin x$ and $f(ax + b)$. - use the composite function rule (chain rule) to establish that $\frac{d}{dx}\{e^{f(x)}\} = f'(x)e^{f(x)}$ - use the composite function rule (chain rule) to establish that $\frac{d}{dx}(\ln f(x)) = \frac{f'(x)}{f(x)}$ - use the logarithmic laws to simplify an expression before differentiating - use the composite function rule (chain rule) to establish and use the derivatives of sin($f(x)$), cos($f(x)$) and tan($f(x)$)	

MA-C3 Applications of Differentiation	
C3.1: The first and second derivatives Students:	
● use the first derivative to investigate the shape of the graph of a function – deduce from the sign of the first derivative whether a function is increasing, decreasing or stationary at a given point or in a given interval – use the first derivative to find intervals over which a function is increasing or decreasing, and where its stationary points are located – use the first derivative to investigate a stationary point of a function over a given domain, classifying it as a local maximum, local minimum or neither – determine the greatest or least value of a function over a given domain (if the domain is not given, the natural domain of the function is assumed) and distinguish between local and global minima and maxima	
● define and interpret the concept of the second derivative as the rate of change of the first derivative function in a variety of contexts, for example recognise acceleration as the second derivative of displacement with respect to time – understand the concepts of concavity and points of inflection and their relationship with the second derivative – use the second derivative to determine concavity and the nature of stationary points – understand that when the second derivative is equal to 0 this does not necessarily represent a point of inflection	
C3.2: Applications of the derivative Students:	
use any of the functions covered in the scope of this syllabus and their derivatives to solve practical and abstract problems	
● use calculus to determine and verify the nature of stationary points, find local and global maxima and minima and points of inflection (horizontal or otherwise), examine behaviour of a function as $x \to \infty$ and $x \to -\infty$ and hence sketch the graph of the function	
● solve optimisation problems for any of the functions covered in the scope of this syllabus, in a wide variety of contexts including but not limited to displacement, velocity, acceleration, area, volume, business, finance and growth and decay – define variables and construct functions to represent the relationships between variables related to contexts involving optimisation, sketching diagrams or completing diagrams if necessary – use calculus to establish the location of local and global maxima and minima, including checking endpoints of an interval if required – evaluate solutions and their reasonableness given the constraints of the domain and formulate appropriate conclusions to optimisation problems	
MA-C4 Integral Calculus	
C4.1: The anti-derivative Students:	
● define anti-differentiation as the reverse of differentiation and use the notation $\int f(x)\,dx$ for anti-derivatives or indefinite integrals	

● recognise that any two anti-derivatives of $f(x)$ differ by a constant	
establish and use the formula $\int x^n dx = \frac{1}{n+1}x^{n+1} + c$, for $n \neq -1$	
establish and use the formula $\int f'(x)[f(x)]^n dx = \frac{1}{n+1} + c$ where $n \neq -1$ (the reverse chain rule)	
● establish and use the formulae for the anti-derivatives of sin $(ax + b)$, cos $(ax + b)$ and $\sec^2(ax + b)$	
● establish and use the formulae $\int e^x dx = e^x + c$ and $\int e^{ax+b} dx = \frac{1}{a}e^{ax+b} + c$	
establish and use the formulae $\int \frac{1}{x} dx = \ln\|x\| + c$ and $\int \frac{f'(x)}{f(x)} dx = \ln\|f(x)\| + c$ for $x \neq 0$, $f(x) \neq 0$ respectively	
● establish and use the formulae $\int a^x dx = \frac{a^x}{in\ a} + c$	
● recognise and use linearity of anti-differentiation - examine families of anti-derivatives of a given function graphically	
● determine indefinite integrals of the form $\int f(ax + b)\, dx$	
● determine $f(x)$, given $f'(x)$ and an initial condition $f(a) = b$ in a range of practical and abstract applications including coordinate geometry, business and science	