NSW Education Standards Authority

Centre Number

Student Number

2026 **HIGHER SCHOOL CERTIFICATE EXAMINATION**

Mathematics Extension 1

General Instructions

- Reading time – 10 minutes
- Working time – 2 hours
- Write using black pen
- Calculators approved by NESA may be used
- A reference sheet is provided at the back of this paper
- For questions in Section II, show relevant mathematical reasoning and/or calculations
- Write your Centre Number and Student Number at the top of this page

Total marks: 70

Section I – 10 marks (pages 2–8)

- Attempt Questions 1–10
- Allow about 15 minutes for this section

Section II – 60 marks (pages 9–15)

- Attempt Questions 11–14
- Allow about 1 hour and 45 minutes for this section

Section I

10 marks
Attempt Questions 1–10
Allow about 15 minutes for this section

Use the multiple-choice answer sheet for Questions 1–10.

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1 What is the maximum value of $\sin\alpha\cos\alpha$?

A. $\frac{1}{2}$

B. 1

C. $\sqrt{2}$

D. 2

2 Given $y = \sin^{-1}\left(\frac{2x}{3}\right)$, what is $\frac{dy}{dx}$?

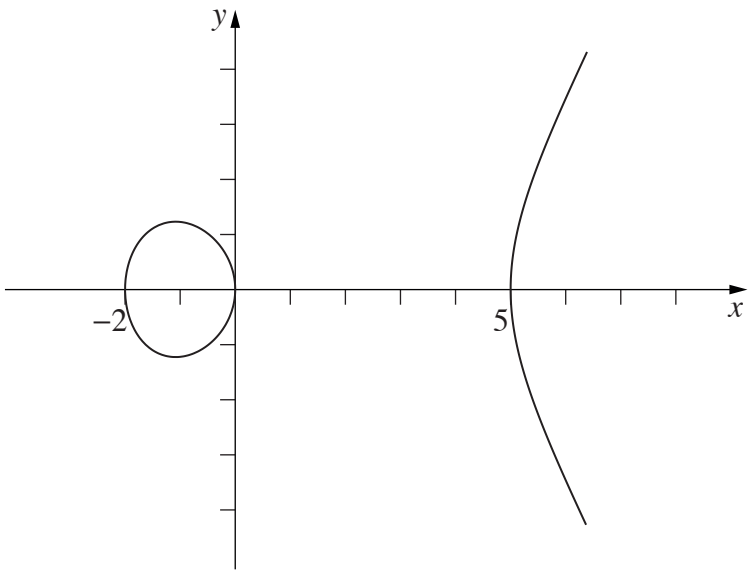
A. $\frac{2}{3}\cos^{-1}\left(\frac{2x}{3}\right)$

B. $-\frac{2}{3}\cos^{-1}\left(\frac{2x}{3}\right)$

C. $\frac{2}{3\sqrt{1-4x^2}}$

D. $\frac{2}{\sqrt{9-4x^2}}$

3 Consider the graph of $y^2 = f(x)$ as shown.



NOT TO SCALE

What is a possible equation for $f(x)$?

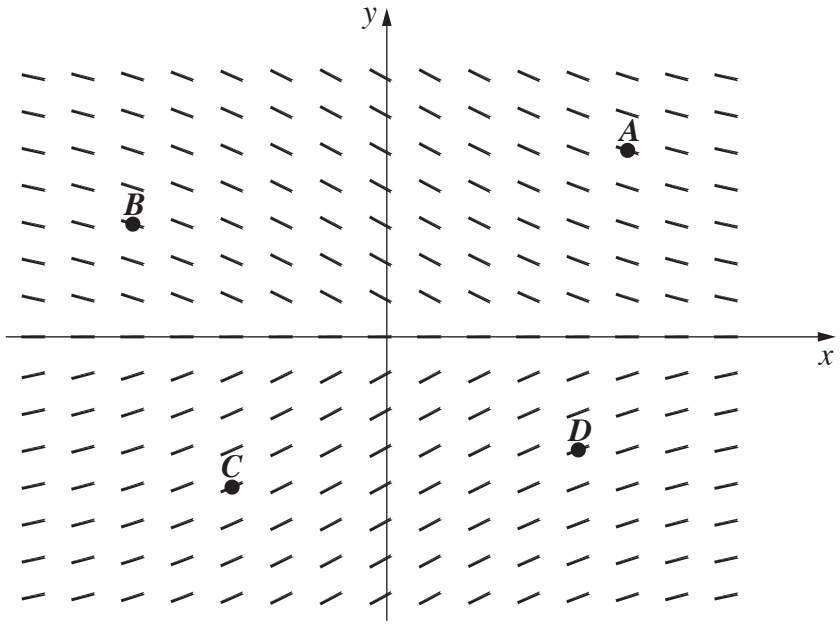
A. $f(x) = -x(x + 2)(x - 5)$

B. $f(x) = -x(x - 2)(x + 5)$

C. $f(x) = x(x + 2)(x - 5)$

D. $f(x) = x(x - 2)(x + 5)$

4 A direction (slope) field representing a differential equation is shown.



A function is increasing and concave down at a point. If the function is a solution to the differential equation, which of the following could be the point?

A. Point *A*

B. Point *B*

C. Point *C*

D. Point *D*

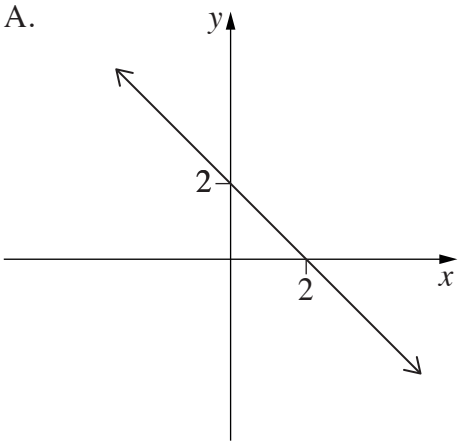
5 A function is defined by the set of parametric equations

$$x = t^2 - 3$$
$$y = 5 - t^2$$

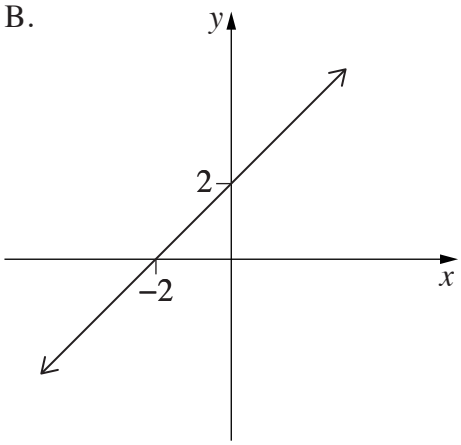
where t is a real number.

Which of the following graphs best represents the function?

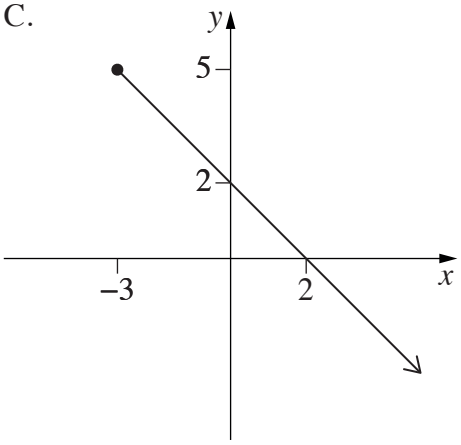
A.



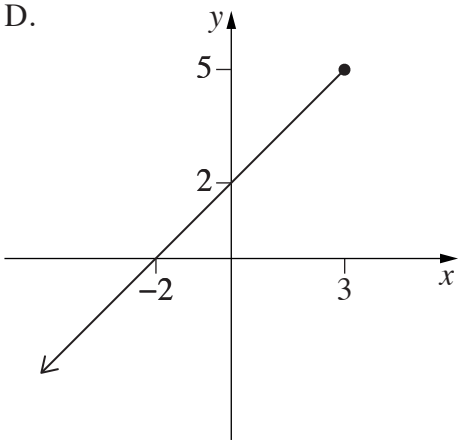
B.



C.



D.



6 Let $f(x) = x^3 - 7x$ and $g(x) = f^{-1}(x)$, where $g(-6) = 2$.

What is the value of $g'(-6)$?

A. $\frac{1}{101}$

B. $\frac{1}{5}$

C. 5

D. 101

7 In a false proof by induction for integers $n \geq 1$, $S(n)$ is the statement:

> In every list containing n numbers, all the numbers are equal to each other.

So $S(1)$ is the statement:

> In every list containing 1 number, that number is equal to itself.

$S(2)$ is the statement:

> In every list containing 2 numbers, those numbers are equal.

Which of the following is FALSE?

A. $S(1)$

B. If $S(1)$ then $S(2)$

C. If $S(2)$ then $S(3)$

D. If $S(3)$ then $S(4)$

8 The position vector of a particle at time t is given by

$$\underset{\sim}{r}(t) = \left(b - \sqrt{a}\cos t\right)\underset{\sim}{i} + \left(a - \frac{1}{b}\sin t\right)\underset{\sim}{j}$$

where a and b are positive real numbers.

If the path of the particle is a circle, which of the following expressions will be equal to 1?

A. $\dfrac{\sqrt{b}}{a}$

B. $\dfrac{a}{b^2}$

C. $a\sqrt{b}$

D. ab^2

9 Socks are randomly selected from a basket containing one odd sock and n matching pairs of socks.

Selecting 7 socks at random guarantees a matching pair of socks. Selecting 6 socks at random does not guarantee a matching pair of socks.

What is the value of n?

A. 5

B. 6

C. 11

D. 12

10 In a lottery game, a barrel contains 46 balls that are numbered 1 to 46. Ten balls are randomly drawn from the barrel. The order of the draw does not matter and drawn balls are not replaced. A player chooses six numbers. A prize is won if all of the numbers chosen by the player match numbers on the balls drawn from the barrel.

What is the probability that the player wins a prize?

A. $\frac{{}^{40}C_4}{{}^{46}C_{10}}$

B. $\frac{{}^{40}C_6}{{}^{46}C_{10}}$

C. $\frac{{}^{46}C_4}{{}^{46}C_{10}}$

D. $\frac{{}^{46}C_6}{{}^{46}C_{10}}$

Section II

60 marks
Attempt Questions 11–14
Allow about 1 hour and 45 minutes for this section

Answer the questions in the Section II Writing Booklet. Extra writing booklets are available.

For questions in Section II, your responses should include relevant mathematical reasoning and/or calculations.

Question 11 (15 marks) Answer Question 11 on pages 2–5 of the Writing Booklet.

(a) When the polynomial $P(x)$ is divided by $9x^2 - 1$ the remainder is $3x + 7$. **2**

Find the remainder when $P(x)$ is divided by $3x - 1$.

(b) Solve $\dfrac{x+6}{x-3} > 4$. **3**

(c) For the function $y = 2\sin^{-1}\left(\dfrac{x}{3}\right)$, find the domain and range. **2**

(d) The vectors $\begin{pmatrix} m \\ -8 \end{pmatrix}$ and $\begin{pmatrix} m-2 \\ 1 \end{pmatrix}$ are parallel. **2**

Find m.

(e) Solve $2\cos^3 x - 2\cos^2 x - \cos x + 1 = 0$ for $-\dfrac{\pi}{2} \le x \le \dfrac{\pi}{2}$. **3**

(f) Evaluate $\displaystyle\int_0^{\frac{1}{\sqrt{2}}} \frac{x}{\sqrt{1-x^4}}\,dx$ using the substitution $u = x^2$. **3**

Question 12 (15 marks) Answer Question 12 on pages 7–10 of the Writing Booklet.

(a) In a particular population, the percentage of people with blood type B+ is 12%. A blood bank takes blood from 20 people one morning. **2**

Find the probability that at least two of the people have blood type B+, correct to 3 decimal places.

(b) Prove by mathematical induction that $n\left(n^2+2\right)$ is divisible by 3, for all integers $n \geq 1$. **3**

(c) Given $\underset{\sim}{a} \cdot \underset{\sim}{b} = 3$, $\left|\underset{\sim}{a}\right| = 2$ and $\left|\underset{\sim}{b}\right| = 3$, find $\left|\underset{\sim}{a} - 2\underset{\sim}{b}\right|$. **2**

(d) Solve $\tan^{-1}(5x) - \tan^{-1}(3x) = \tan^{-1}\left(\frac{1}{4}\right)$. **2**

(e) The angle between the vectors $\begin{pmatrix} m \\ 2 \end{pmatrix}$ and $\begin{pmatrix} 1 \\ 3 \end{pmatrix}$ is $\frac{\pi}{4}$. **3**

Find the value(s) of m.

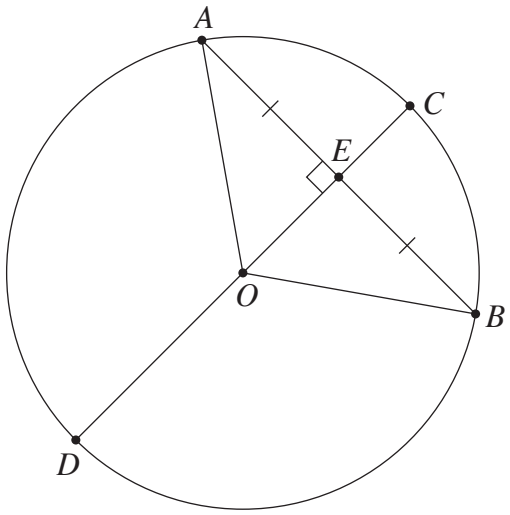
Question 12 continues on page 11

(f) The points A, B, C and D lie on the circumference of the circle centred at O with radius 5.

The position vector $\overrightarrow{OA}$ is $\begin{pmatrix} 3\cos\theta - 4\sin\theta \\ 3\sin\theta + 4\cos\theta \end{pmatrix}$.

The position vector $\overrightarrow{OB}$ is $\begin{pmatrix} 3\cos\theta + 4\sin\theta \\ 3\sin\theta - 4\cos\theta \end{pmatrix}$.

The diameter $\overrightarrow{CD}$ is the perpendicular bisector of $\overrightarrow{AB}$, which intersects it at E.



(i) Show that $\overrightarrow{OE} = 3\begin{pmatrix} \cos\theta \\ \sin\theta \end{pmatrix}$. **1**

(ii) Hence show that $\left|\overrightarrow{AE}\right|^2 = \left|\overrightarrow{CE}\right|\left|\overrightarrow{DE}\right|$. **2**

End of Question 12

Question 13 (15 marks) Answer Question 13 on pages 12–15 of the Writing Booklet.

(a) A multiple-choice exam has n questions, each with four possible answers. **3**

It is assumed that the probability of guessing the correct answer is $p = \frac{1}{4}$, and the sample proportion $\hat{p}$ is approximately normally distributed with $\mu = p$ and $\sigma^2 = \frac{p(1-p)}{n}$.

In order to pass the exam, a student must correctly answer at least 20% of the questions.

If the student guesses every answer, find the smallest value of n which gives them a 99.01% chance of passing the exam.

You may use the standard normal distribution and the information on page 15.

(b) Prove $\binom{m+n}{2} = \binom{m}{2} + \binom{n}{2} + \binom{m}{1}\binom{n}{1}$, where m and n are positive integers. **2**

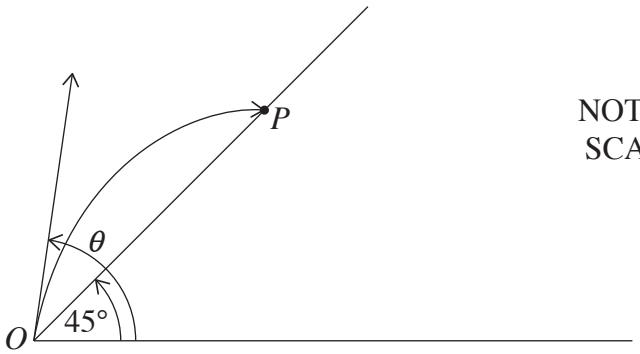
(c) Consider the region bounded by the curve $y = \frac{5}{9}x^2$, the y-axis and the line $y = h$. **4**

A drinking glass of height 10 cm is formed by rotating the region about the y-axis. The drinking glass is filled with water at a constant rate of 15 $\text{cm}^3\,\text{s}^{-1}$.

Find the rate at which the height h of water is rising with respect to time when the drinking glass is filled to half its capacity.

Question 13 continues on page 13

(d) An inclined plane passes through the origin O at an angle of 45° to the horizontal. A particle is projected from O with initial speed 20 m s^{-1} at an angle of θ to the horizontal. The particle hits the plane at P as shown.



NOT TO SCALE

The position vector of the particle at time t seconds is

$$\underset{\sim}{r}(t) = 20t\cos\theta\,\underset{\sim}{i} + \left(20t\sin\theta - 5t^2\right)\underset{\sim}{j}. \qquad \text{(Do NOT prove this.)}$$

(i) Show that the length, ℓ, of OP is given by **3**

$$\ell = 80\sqrt{2}\cos\theta(\sin\theta - \cos\theta).$$

(ii) Find θ such that ℓ is a maximum. **3**

End of Question 13

Question 14 (15 marks) Answer Question 14 on pages 17–20 of the Writing Booklet.

(a) Suppose $f(x)$ is an increasing function and is always concave up. **2**

Prove that the inverse function $g(x)$ is concave down.

(b) Find the solution to the differential equation $\cos^2 x \dfrac{dy}{dx} = y$ that passes through the point $\left(\dfrac{\pi}{4}, -e\right)$. Give your answer in the form $y = f(x)$. **3**

(c) Find the values of m such that the equation **3**

$$3(\cos x - \sin x) + m \sin x = 5$$

has no solutions.

(d) Let $P(t)$ be the population of a particular species, where t is the time in years. The population satisfies **4**

$$\frac{dP}{dt} = \frac{P(5000 - P)}{5000} \text{ and } P(0) = 7000.$$

How many years does it take for the population to reach 5100? You may use the result

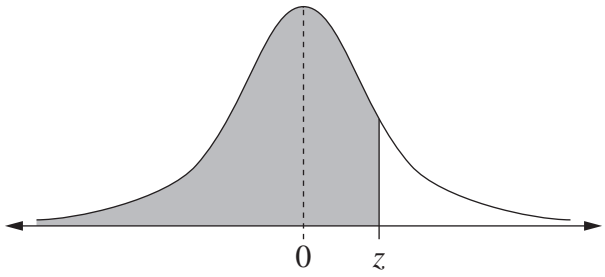
$$\frac{5000}{P(5000 - P)} = \frac{1}{P} + \frac{1}{5000 - P}. \qquad \text{(Do NOT prove this.)}$$

(e) Show that $y = x \tan^{-1} x$ has only one stationary point. **3**

End of paper

Use the information below to answer Question 13 (a).

Table of values $P(Z \leq z)$ for the normal distribution $N(0, 1)$



z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.4	0.9918	0.9920	0.9922	0.9925	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952
2.6	0.9953	0.9955	0.9956	0.9957	0.9959	0.9960	0.9961	0.9962	0.9963	0.9964
2.7	0.9965	0.9966	0.9967	0.9968	0.9969	0.9970	0.9971	0.9972	0.9973	0.9974
2.8	0.9974	0.9975	0.9976	0.9977	0.9977	0.9978	0.9979	0.9979	0.9980	0.9981
2.9	0.9981	0.9982	0.9982	0.9983	0.9984	0.9984	0.9985	0.9985	0.9986	0.9986
3.0	0.9987	0.9987	0.9987	0.9988	0.9988	0.9989	0.9989	0.9989	0.9990	0.9990
3.1	0.9990	0.9991	0.9991	0.9991	0.9992	0.9992	0.9992	0.9992	0.9993	0.9993
3.2	0.9993	0.9993	0.9994	0.9994	0.9994	0.9994	0.9994	0.9995	0.9995	0.9995

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2026 **HIGHER SCHOOL CERTIFICATE EXAMINATION**

Mathematics Advanced
Mathematics Extension 1
Mathematics Extension 2

REFERENCE SHEET

Measurement

Length

$$l = \frac{\theta}{360} \times 2\pi r$$

Area

$$A = \frac{\theta}{360} \times \pi r^2$$

$$A = \frac{h}{2}(a + b)$$

Surface area

$$A = 2\pi r^2 + 2\pi rh$$

$$A = 4\pi r^2$$

Volume

$$V = \frac{1}{3}Ah$$

$$V = \frac{4}{3}\pi r^3$$

Functions

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

For $ax^3 + bx^2 + cx + d = 0$:

$$\alpha + \beta + \gamma = -\frac{b}{a}$$

$$\alpha\beta + \alpha\gamma + \beta\gamma = \frac{c}{a}$$

$$\text{and } \alpha\beta\gamma = -\frac{d}{a}$$

Relations

$$(x - h)^2 + (y - k)^2 = r^2$$

Financial Mathematics

$$A = P(1 + r)^n$$

Sequences and series

$$T_n = a + (n - 1)d$$

$$S_n = \frac{n}{2}\left[2a + (n - 1)d\right] = \frac{n}{2}(a + l)$$

$$T_n = ar^{n-1}$$

$$S_n = \frac{a(1 - r^n)}{1 - r} = \frac{a(r^n - 1)}{r - 1}, \; r \neq 1$$

$$S = \frac{a}{1 - r}, \; |r| < 1$$

Logarithmic and Exponential Functions

$$\log_a a^x = x = a^{\log_a x}$$

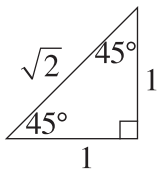
$$\log_a x = \frac{\log_b x}{\log_b a}$$

$$a^x = e^{x \ln a}$$

Trigonometric Functions

$$\sin A = \frac{\text{opp}}{\text{hyp}}, \quad \cos A = \frac{\text{adj}}{\text{hyp}}, \quad \tan A = \frac{\text{opp}}{\text{adj}}$$

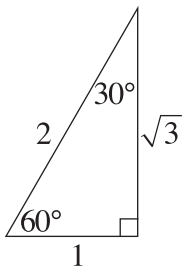
$$A = \frac{1}{2}ab\sin C$$



$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$c^2 = a^2 + b^2 - 2ab\cos C$$

$$\cos C = \frac{a^2 + b^2 - c^2}{2ab}$$



$$l = r\theta$$

$$A = \frac{1}{2}r^2\theta$$

Trigonometric identities

$$\sec A = \frac{1}{\cos A}, \ \cos A \neq 0$$

$$\operatorname{cosec} A = \frac{1}{\sin A}, \ \sin A \neq 0$$

$$\cot A = \frac{\cos A}{\sin A}, \ \sin A \neq 0$$

$$\cos^2 x + \sin^2 x = 1$$

Compound angles

$$\sin(A + B) = \sin A\cos B + \cos A\sin B$$

$$\cos(A + B) = \cos A\cos B - \sin A\sin B$$

$$\tan(A + B) = \frac{\tan A + \tan B}{1 - \tan A\tan B}$$

If $t = \tan\frac{A}{2}$ then $\sin A = \frac{2t}{1 + t^2}$

$$\cos A = \frac{1 - t^2}{1 + t^2}$$

$$\tan A = \frac{2t}{1 - t^2}$$

$$\cos A\cos B = \frac{1}{2}\left[\cos(A - B) + \cos(A + B)\right]$$

$$\sin A\sin B = \frac{1}{2}\left[\cos(A - B) - \cos(A + B)\right]$$

$$\sin A\cos B = \frac{1}{2}\left[\sin(A + B) + \sin(A - B)\right]$$

$$\cos A\sin B = \frac{1}{2}\left[\sin(A + B) - \sin(A - B)\right]$$

$$\sin^2 nx = \frac{1}{2}(1 - \cos 2nx)$$

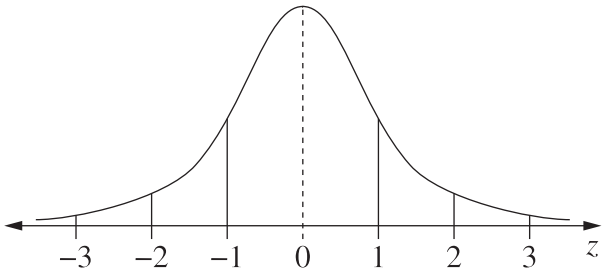
$$\cos^2 nx = \frac{1}{2}(1 + \cos 2nx)$$

Statistical Analysis

$$z = \frac{x - \mu}{\sigma}$$

An outlier is a score
less than $Q_1 - 1.5 \times IQR$
or
more than $Q_3 + 1.5 \times IQR$

Normal distribution



- approximately 68% of scores have z-scores between –1 and 1
- approximately 95% of scores have z-scores between –2 and 2
- approximately 99.7% of scores have z-scores between –3 and 3

$$E(X) = \mu$$

$$\text{Var}(X) = E\left[(X - \mu)^2\right] = E\left(X^2\right) - \mu^2$$

Probability

$$P(A \cap B) = P(A)P(B)$$

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

$$P(A|B) = \frac{P(A \cap B)}{P(B)}, P(B) \neq 0$$

Continuous random variables

$$P(X \leq r) = \int_a^r f(x)\,dx$$

$$P(a < X < b) = \int_a^b f(x)\,dx$$

Binomial distribution

$$P(X = r) = {}^nC_r p^r(1 - p)^{n-r}$$

$$X \sim \text{Bin}(n, p)$$

$$\Rightarrow \ P(X = x)$$

$$= \binom{n}{x} p^x(1 - p)^{n-x}, \ x = 0, 1, \ldots, n$$

$$E(X) = np$$

$$\text{Var}(X) = np(1 - p)$$

Differential Calculus

Function	Derivative
$y = f(x)^n$	$\frac{dy}{dx} = nf'(x)\left[f(x)\right]^{n-1}$
$y = uv$	$\frac{dy}{dx} = u\frac{dv}{dx} + v\frac{du}{dx}$
$y = g(u)$ where $u = f(x)$	$\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx}$
$y = \frac{u}{v}$	$\frac{dy}{dx} = \frac{v\frac{du}{dx} - u\frac{dv}{dx}}{v^2}$
$y = \sin f(x)$	$\frac{dy}{dx} = f'(x)\cos f(x)$
$y = \cos f(x)$	$\frac{dy}{dx} = -f'(x)\sin f(x)$
$y = \tan f(x)$	$\frac{dy}{dx} = f'(x)\sec^2 f(x)$
$y = e^{f(x)}$	$\frac{dy}{dx} = f'(x)e^{f(x)}$
$y = \ln f(x)$	$\frac{dy}{dx} = \frac{f'(x)}{f(x)}$
$y = a^{f(x)}$	$\frac{dy}{dx} = (\ln a) f'(x)a^{f(x)}$
$y = \log_a f(x)$	$\frac{dy}{dx} = \frac{f'(x)}{(\ln a) f(x)}$
$y = \sin^{-1} f(x)$	$\frac{dy}{dx} = \frac{f'(x)}{\sqrt{1 - \left[f(x)\right]^2}}$
$y = \cos^{-1} f(x)$	$\frac{dy}{dx} = -\frac{f'(x)}{\sqrt{1 - \left[f(x)\right]^2}}$
$y = \tan^{-1} f(x)$	$\frac{dy}{dx} = \frac{f'(x)}{1 + \left[f(x)\right]^2}$

Integral Calculus

$$\int f'(x)\left[f(x)\right]^n dx = \frac{1}{n+1}\left[f(x)\right]^{n+1} + c$$

where $n \neq -1$

$$\int f'(x)\sin f(x)\,dx = -\cos f(x) + c$$

$$\int f'(x)\cos f(x)\,dx = \sin f(x) + c$$

$$\int f'(x)\sec^2 f(x)\,dx = \tan f(x) + c$$

$$\int f'(x)e^{f(x)}dx = e^{f(x)} + c$$

$$\int \frac{f'(x)}{f(x)}dx = \ln\left|f(x)\right| + c$$

$$\int f'(x)a^{f(x)}dx = \frac{a^{f(x)}}{\ln a} + c$$

$$\int \frac{f'(x)}{\sqrt{a^2 - \left[f(x)\right]^2}}dx = \sin^{-1}\frac{f(x)}{a} + c$$

$$\int \frac{f'(x)}{a^2 + \left[f(x)\right]^2}dx = \frac{1}{a}\tan^{-1}\frac{f(x)}{a} + c$$

$$\int u\frac{dv}{dx}dx = uv - \int v\frac{du}{dx}dx$$

$$\int_a^b f(x)\,dx$$

$$\approx \frac{b-a}{2n}\left\{f(a) + f(b) + 2\left[f\left(x_1\right) + \cdots + f\left(x_{n-1}\right)\right]\right\}$$

where $a = x_0$ and $b = x_n$

Combinatorics

$${}^{n}P_{r} = \frac{n!}{(n-r)!}$$

$$\binom{n}{r} = {}^{n}C_{r} = \frac{n!}{r!(n-r)!}$$

$$(x+a)^{n} = x^{n} + \binom{n}{1}x^{n-1}a + \cdots + \binom{n}{r}x^{n-r}a^{r} + \cdots + a^{n}$$

Vectors

$$\left| \underset{\sim}{u} \right| = \left| x\underset{\sim}{i} + y\underset{\sim}{j} \right| = \sqrt{x^{2}+y^{2}}$$

$$\underset{\sim}{u} \cdot \underset{\sim}{v} = \left| \underset{\sim}{u} \right| \left| \underset{\sim}{v} \right| \cos\theta = x_{1}x_{2} + y_{1}y_{2},$$

where $\underset{\sim}{u} = x_{1}\underset{\sim}{i} + y_{1}\underset{\sim}{j}$

and $\underset{\sim}{v} = x_{2}\underset{\sim}{i} + y_{2}\underset{\sim}{j}$

$$\underset{\sim}{r} = \underset{\sim}{a} + \lambda\underset{\sim}{b}$$

Complex Numbers

$$z = a + ib = r(\cos\theta + i\sin\theta)$$
$$= re^{i\theta}$$

$$\left[r(\cos\theta + i\sin\theta)\right]^{n} = r^{n}(\cos n\theta + i\sin n\theta)$$
$$= r^{n}e^{in\theta}$$

Mechanics

$$\frac{d^{2}x}{dt^{2}} = \frac{dv}{dt} = v\frac{dv}{dx} = \frac{d}{dx}\left(\frac{1}{2}v^{2}\right)$$

$$x = a\cos(nt + \alpha) + c$$

$$x = a\sin(nt + \alpha) + c$$

$$\ddot{x} = -n^{2}(x - c)$$

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Centre Number

Student Number

Student Name

2026 **HIGHER SCHOOL CERTIFICATE EXAMINATION**

Mathematics Extension 1

Section II Writing Booklet

Instructions

- Write your Centre Number, Student Number and Student Name at the top of this page
- Use this writing booklet for Section II ONLY
- Follow the instructions inside this booklet as to where you should write your answers
- Write the number of this booklet and the total number of booklets that you have used for this section (eg: **1** of **3**) ⇨ ____ of ____

this booklet

number of booklets for this section

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2141 15250

Answer Question 11 on pages 2–5.

1	1

Question Number

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End of Question 11

Go to page 7 for Question 12

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Answer Question 12 on pages 7–10.

1	2

Question Number

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End of Question 12

Go to page 12 for Question 13

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Answer Question 13 on pages 12–15.

1	3

Question Number

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End of Question 13

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Answer Question 14 on pages 17–20.

1	4

Question Number

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