Name	Register Number	Class	Calculator Model

MANJUSRI SECONDARY SCHOOL

文 殊 中 學

智行蕆願

PRELIMINARY EXAMINATION 2021

	Subject:	Additional Mathematics
	Level:	Secondary 4 Express
	Paper:	4049/02
	Date:	30 August 2021
	Duration:	2 hours 15 minutes
	Setter:	Mdm Tuan Chui Lin

Candidates answer on the Question Paper.
No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Name, Register Number and Class in the spaces at the top of this page.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.

Answer **all** questions.
Give non-exact numerical answers corrected to 3 significant figures, or 1 decimal place in the case of angles in degrees, unless a different level of accuracy is specified in the question.
The use of an approved scientific calculator is expected, where appropriate.
You are reminded of the need for clear presentation in your answers.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

The total number of marks for this paper is **84**.

Marks Obtained
84

Mathematical Formulae

1. ALGEBRA

Quadratic Equation

For the equation $ax^2 + bx + c = 0$,

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

Binomial Expansion

$$(a+b)^n = a^n + \binom{n}{1} a^{n-1} b + \binom{n}{2} a^{n-2} b^2 + \ldots + \binom{n}{r} a^{n-r} b^r + \ldots + b^n,$$

where n is a positive integer and $\binom{n}{r} = \frac{n!}{r(n-r)!} = \frac{n(n-1)\ldots(n-r+1)}{r!}$

2. TRIGONOMETRY

Identities

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

$$\sec^2 A = 1 + \tan^2 A$$

$$\operatorname{cosec}^2 A = 1 + \cot^2 A$$

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

$$\cos(A \pm B) = \cos A \cos B \mp \sin A \sin B$$

$$\tan(A \pm B) = \frac{\tan A \pm \tan B}{1 \mp \tan A \tan B}$$

$$\sin 2A = 2 \sin A \cos A$$

$$\cos 2A = \cos^2 A - \sin^2 A = 2\cos^2 A - 1 = 1 - 2\sin^2 A$$

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

Formulae for ΔABC

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

$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$\Delta = \frac{1}{2} bc \sin A$$

Answer all questions

1 Find the values of x and y which satisfy the equations [4]

$$4^{x-y} = \sqrt[3]{8},$$

$$\frac{3^x}{9^y} = \left(\frac{1}{3}\right)^{-2}.$$

2 **(i)** Express the function $h(x) = 4x^2 + 24x + 15$ in the form $h(x) = a(x + b)^2 + c$, where a, b and c are constants. [2]

(ii) Hence determine the minimum value of $h(x)$ and the corresponding value of x. Give reasons to support your answer. [2]

3 A curve has the equation $y = 2x^2 + 5x + k$, where k is a constant.

(i) In the case where k = –3, find the range of values for x for which $y \geq 0$. [2]

(ii) Find the value of k for which the line $y - x = 3$ is a tangent to the curve. [2]

4 It is given that $\lg(a-b) = \lg a + \lg b$.

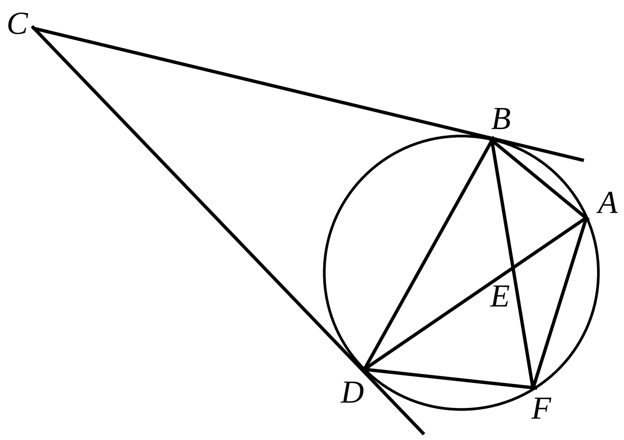
(i) Express a in terms of b. [3]

(ii) State the conditions of a and b for the equation to exist. [2]

5 **(a)** Find the equation of normal to the curve $y = \sqrt{2-x}$ at $x = 1$. [3]

(b) Water is poured into a container at the rate of 94 cm^3/s. The volume of water in the container is V cm^3, where $V = 4(\frac{h^3}{2} + \frac{6}{h^2})$ and h is the height of water in the container. Find the rate at which height of water is increasing when $h = 3$ cm. [3]

6



In the diagram, the points A, B, D and F lie on a circle. The lines AD and BF intersect at the point E. The tangents to the circle at B and D meet at the point C.

(a) Prove that $\angle BAD + \angle BFD + \angle BCD = 180°$. [2]

(b) Prove that ΔAEF is similar to ΔBED. [2]

(c) Prove that $AF \times BE = AE \times BD$. [2]

7 **(a)** By considering the general term in the binomial expansion of $\left(x^4 - \frac{2}{x^2}\right)^{10}$,

(i) explain why there are no odd powers of x in this expansion. [3]

(ii) explain why the term independent of x does not exist. [2]

(b) **(i)** Find, in descending power of x, the first 3 terms in the expansion of $\left(3+\frac{1}{\sqrt{x}}\right)^7$. [2]

(ii) Hence, find the value of 3.5^7, giving your answer correct to 2 decimal places. [2]

8 It is given that $f'(x) = 3\sin 2x + 4\cos 2x$ for $0 \le x \le \pi$.

(i) Find f(x) and f ''(x), taking constant c = 0. [2]

(ii) Find the values of x for which the curve has a stationary point. [3]

(iii) Hence, or otherwise, find the coordinates of the stationary points and determine their nature. [4]

9 **(i)** Express $\dfrac{2x+1}{x-3}$ in the form $m+\dfrac{n}{x-3}$, where m and n are integers. [2]

(ii) Differentiate $(2x+1)\ln(x-3)$ with respect to x. [2]

(iii) Using the results in (i) and (ii), find $\int \ln(x-3)\,\mathrm{d}x$. [4]

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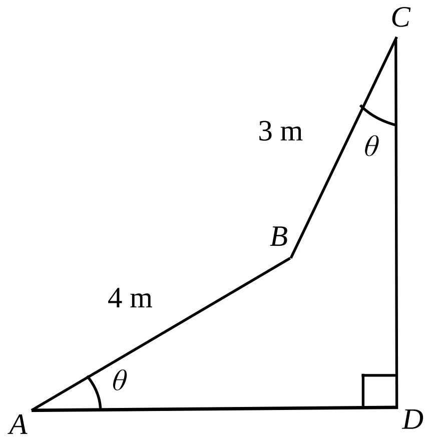


The diagram above shows two poles *AB* and *BC* where the pole *AB* touches the floor at *A* and the pole *BC* touches vertical wall at *C*. It is given that $AB = 4$ m, $BC = 3$ m and $\angle DAB = \angle BCD = \theta$ where ϑ is an acute angle.

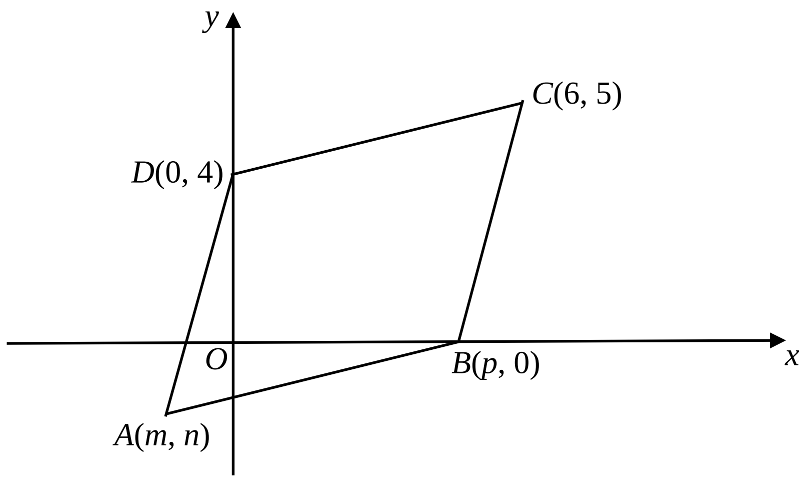
(i) Show that $CD = 3\cos\theta + 4\sin\theta$. [2]

(ii) Express *CD* in the form of $R\cos(\theta - \alpha)$. [2]

(iii) State the maximum value of CD and the corresponding value of θ. [2]

(iv) Find the value of θ when $CD = 4$. [2]

11 Solution to this question by accurate drawing will not be accepted.



ABCD is a parallelogram and the equation of *BD* is given to be $x + y - 4 = 0$.
It is also given that $A(m, n)$, $B(p, 0)$, $C(6, 5)$ and $D(0, 4)$.

(i) Show that $p = 4$. [1]

(ii) Find the value of m and n. [2]

(iii) Find the area of *ABCD*. [2]

(iv) A student claims that the diagonals *AC* and *BD* are perpendicular to each other. Show, with clear working, whether the student is correct. [2]

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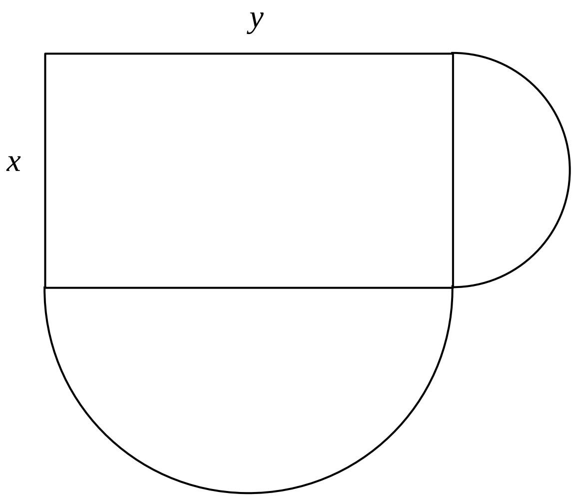


The figure above shows a fence built along the perimeter of a rectangle and the circumference of 2 semi-circles with diameters x m and y m.

(i) Given that the total length of the fence is given to be $\frac{\pi}{2}+2$ m, form an equation in x and y. [2]

(ii) Show that the total area, A m^2, enclosed by the fence is given by [3]

$A=(\frac{1}{4}\pi-1)x^2+(1-\frac{1}{4}\pi)x+\frac{1}{8}\pi$.

(ii) Find the value of x for which A has a maximum value and find this value of A in exact form. [5]

13 The table below shows the experimental values of two variables x and y.

x	1.2	1.4	1.6	1.8	2.0
y	4.43	5.88	7.68	10.98	12.00

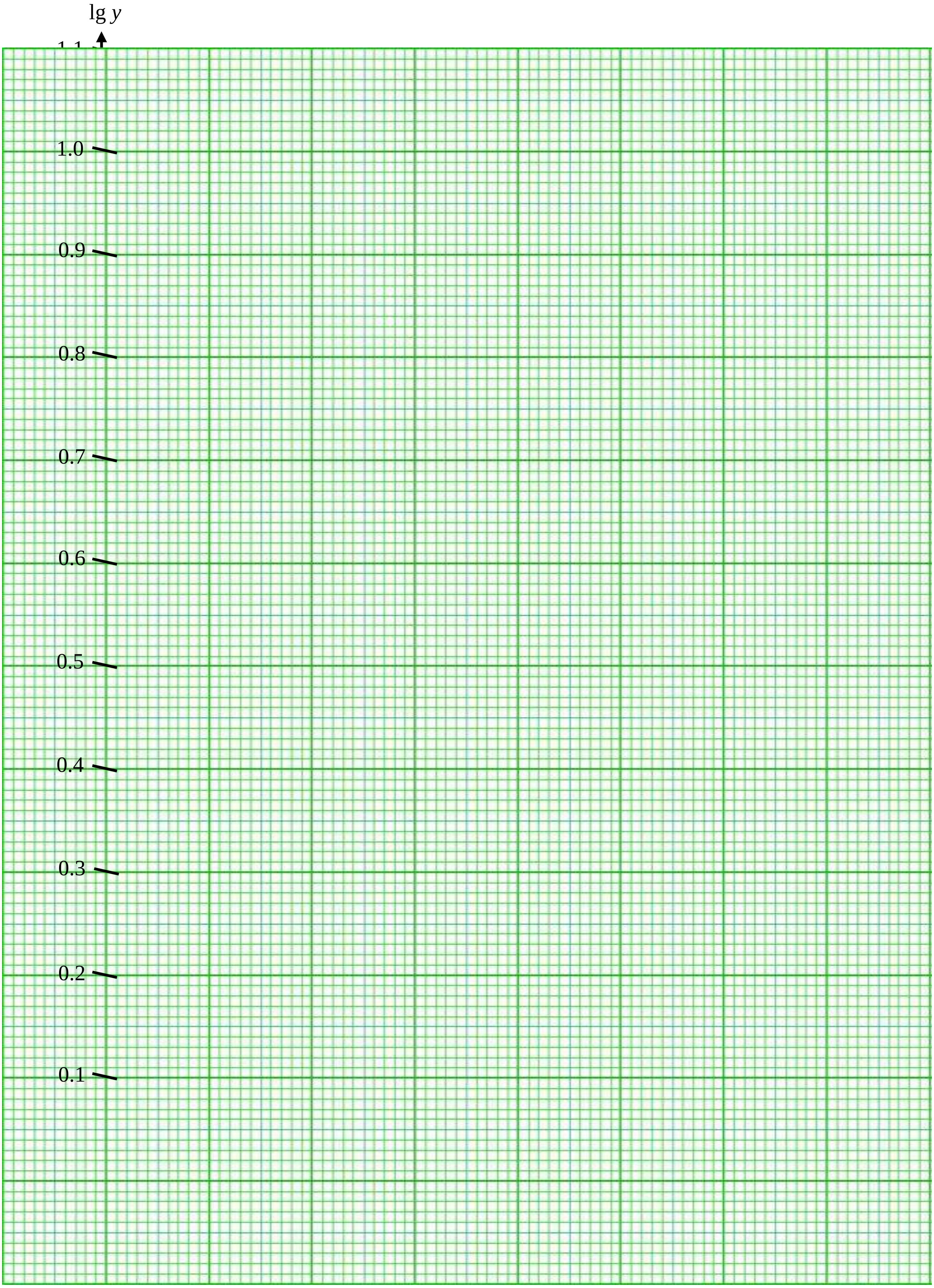
It is known that x and y are related by the equation $y = px^q$, where p and q are constants.

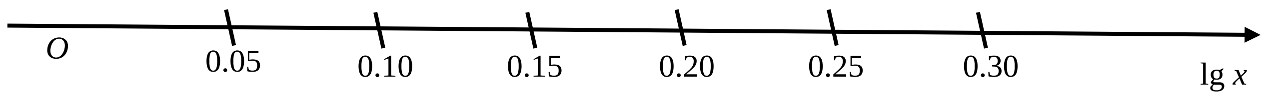
(i) On the grid next page, plot lg y against lg x and draw a straight line graph. [2]

(ii) There is an incorrect recording of y value in the table. Determine the incorrect value and use your graph to estimate the value of y to replace the incorrect recording. [2]

(iii) Use your graph to estimate the value of p and q. [4]

(iv) Estimate the value of x when y is 5. [2]


lg y
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1



☺ End of Paper 2 ☺

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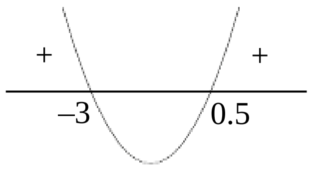
	4049/02/PRE/2021 Answers Key		
1	$x - -1$ $y = -1\frac{1}{2}$	**8(ii)**	$x = 1.11, 2.68$
		8(iii)	(1.11, 2.50) is a max point (2.68, –2.50) is a min point
2(i)	$h(x) = 4(x+3)^2 - 21$		
2(ii)	Since $(x+3)^2 \geq 0$, Min $h(x)$ = –21 at x = –3	**9(i)**	$\frac{2x+1}{x-3} = 2 + \frac{7}{x-3}$
		9(ii)	$\frac{\mathrm{d}y}{\mathrm{d}x} = \frac{2x+1}{x-3} + 2\ln(x-3)$
3(i)	$x \leq -3$ or $x \geq \frac{1}{2}$	**9(iii)**	$\int \ln(x-3)\mathrm{d}x = (x-3)\ln(x-3) - x + c$
3(ii)	$k - 5$		
		10(i)	$CD = 3\cos\theta + 4\sin\theta$
4(i)	$a = \frac{b}{1-b}$	**10(ii)**	$CD = 5\cos(\theta - 0.927)$ or $5\cos(\theta - 53.1°)$
4(ii)	$a - b > 0$ $b \neq 1$	**10(iii)**	Max CD = 5 $\theta = 0.927$ or 53.13°
		10(iv)	$\theta = 0.284, 1.57$ or $\theta = 16.2°, 90.0°$
5(a)	$y = 2x - 1$		
5(b)	$\frac{\mathrm{d}h}{\mathrm{d}t} = 1.8$ cm/s	**11(i)**	$p = 4$
		11(ii)	$m = -2$ $n = -1$
6(a)	$\angle BAD + \angle BFD + \angle BCD = 180°$	**11(iii)**	28 units^2
6(b)	ΔAEF is similar to ΔBED (AA)	**11(iv)**	AC is not perpendicular to BD
6(c)	$AF \times BE = AE \times BD$ (Ratio)		
		12(i)	$y = 1 - x$
7(a)(i)	Since $6r$ is an even number for all positive integers of r, then $40 - 6r$ must be an even number. Hence there are no odd powers of x in the expansion.	**12(ii)**	$A = (\frac{1}{4}\pi - 1)x^2 + (1 - \frac{1}{4}\pi)x + \frac{1}{8}\pi$
7(a)(ii)	Since r is not an integer or whole number, the term independent of x does not exist.	**12(iii)**	Max $A = \frac{1}{4}(\frac{\pi}{4} + 1)$ m^2 at $x = \frac{1}{2}$ m
7(b)(i)	$\left(3 + \frac{1}{\sqrt{x}}\right)^7 = 2187 + \frac{5103}{\sqrt{x}} + \frac{5103}{x} + \ldots$		

7(b)(ii)	6014.25	**13(i)**	$\lg y = q\lg x + \lg p$
		13(ii)	The incorrect reading of y is 10.98. The correct reading should be 9.72.
8(i)	$f''(x) = 6\cos 2x - 8\sin 2x$ $f(x) = \sin 2x - \frac{3}{2}\cos 2x$	**13(iii)**	$p = 3.02$ $q = 2$
		13(iv)	$x = 1.30$

Solution to 2021 MJR Prelim AMath Paper 2

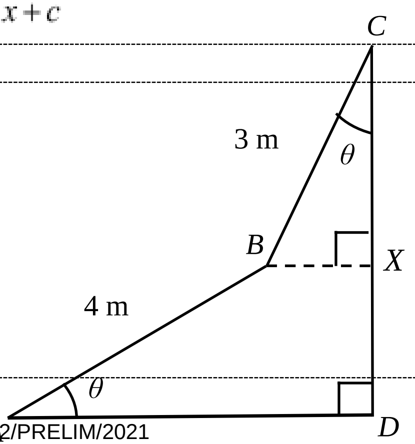
1	$4^{x-y} = \sqrt[3]{8}$ $2^{2(x-y)} = 2^1$ $2(x-y) = 1$ $x - y = \frac{1}{2}$ ----------- (1) $\frac{3^x}{9^y} = \left(\frac{1}{3}\right)^{-2}$ $\frac{3^x}{3^{2y}} = 3^2$ $3^{x-2y} = 3^2$ $x - 2y = 2$ ----------- (2) (1) – (2): $-y-(-2y) = \frac{1}{2} - 2$ $y = -1\frac{1}{2}$ $x = \frac{1}{2} + (-1\frac{1}{2})$ $x = -1$	M1 for attempt to form eqn (1) M1 for attempt to form eqn (2) A1 A1
2(i)	$h(x) = 4x^2 + 24x + 15$ $h(x) = 4(x^2 + 6x) + 15$ $h(x) = 4[x^2 + 6x + (\frac{6}{2})^2 - (\frac{6}{2})^2] + 15$ $h(x) = 4(x+3)^2 - 4(3)^2 + 15$ $h(x) = 4(x+3)^2 - 21$	M1 for correct method A1
2(ii)	Min $h(x)$ = –21 at x = –3 Since $(x+3)^2 \geq 0$, Min $h(x)$ occurs when $(x+3)^2 = 0$ So Min $h(x)$ = –21 Corresponding x occurs when $(x+3)^2 = 0$ So corr x = –3	B1 B1 for $(x+3)^2 \geq 0$

3(i)	$y = 2x^2 + 5x - 3$  When $y \geq 0$, $2x^2 + 5x - 3 \geq 0$ $(2x-1)(x+3) \geq 0$ $x \leq -3$ or $x \geq \frac{1}{2}$	M1 for factorise A1
3(ii)	$y = 2x^2 + 5x + k$ ------- (1) $y - x = 3$ ------- (2) Sub (1) into (2) $2x^2 + 5x + k - x = 3$ $2x^2 + 4x + k - 3 = 0$ Since tangent, $b^2 - 4ac = 0$ $4^2 - 4(2)(k-3) = 0$ $16 - 8k + 24 = 0$ $k = 5$	M1 for $b^2 - 4ac = 0$ A1
4(i)	$\lg(a-b) = \lg(ab)$ $a - b = ab$ $a - ab = b$ $a(1-b) = b$ $a = \frac{b}{1-b}$	M1 for product rule M1 for removing lg A1
4(ii)	From $\lg(a-b)$, $a - b > 0$ From $a = \frac{b}{1-b}$, $1 - b \neq 0$ and hence $b \neq 1$	B1 B1
5(a)	$y = \sqrt{2-x} = (2-x)^{\frac{1}{2}}$ $\frac{dy}{dx} = \frac{1}{2}(2-x)^{-\frac{1}{2}}(-1) = \frac{-1}{2\sqrt{2-x}}$ At $x = 1$, $\frac{dy}{dx} = \frac{-1}{2\sqrt{2-1}} = -\frac{1}{2}$ $y = \sqrt{2-1} = 1$	M1 for $\frac{dy}{dx}$ M1 for gradient of normal

	Gradient of normal = 2 Eqn of normal is $y-1=2(x-1)$ $y=2x-1$	A1
5(b)	$V=4(\frac{h^3}{2}+\frac{6}{h^2})$ $V=4(\frac{1}{2}h^3+6h^{-2})$ $\frac{dV}{dh}=4(\frac{3}{2}h^2-12h^{-3})=6h^2-\frac{48}{h^3}$ $\frac{dV}{dt}=\frac{dV}{dh}\times\frac{dh}{dt}$ When h = 3, $94=[6(3)^2-\frac{48}{3^3}]\times\frac{dh}{dt}$ $\frac{dh}{dt}=1.8$ cm/s	M1 for differentiation M1 for Chain Rule A1
6(a)	$\angle BDC = \angle BAD$ (Alt Seg Thm) $\angle CBD = \angle BFD$ (Alt Seg Thm) $\angle BDC + \angle CBD + \angle BCD = 180°$ ($\angle$ Sum of Δ) $\angle BAD + \angle BFD + \angle BCD = 180°$	M1 for Alt Seg Thm or Angles in the same seg A1
6(b)	$\angle AFB = \angle ADB$ ($\angle$ in the same seg) $\angle DBF = \angle DAF$ ($\angle$ in the same seg) $\angle AEF = \angle BED$ (vert opp $\angle$s) ΔAEF is similar to ΔBED (AA)	M1 for 2 reasons A1
6(c)	Since ΔAEF is similar to ΔBED, $\frac{AF}{BD}=\frac{AE}{BE}$ $AF \times BE = AE \times BD$	M1 for ratio A1
7(a)(i)	$\left(x^4-\frac{2}{x^2}\right)^{10}$ $T_{r+1}=\binom{10}{r}\left(x^4\right)^{10-r}\left(-\frac{2}{x^2}\right)^r$ $T_{r+1}=\binom{10}{r}x^{40-4r}(-2)^r x^{-2r}$ $T_{r+1}=\binom{10}{r}(-2)^r x^{40-6r}$ Since $6r$ is an even number for all positive integers of r, then $40-6r$ must be an even number. Hence there are no odd powers of x in the expansion.	M1 for T_{r+1} M1 A1

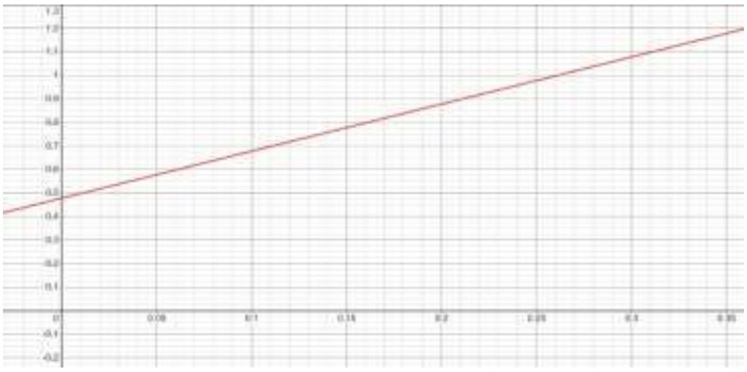
7(a)(ii)	For x^0 to exist, $40-6r=0$ $r=\frac{20}{3}$ Since *r* is not an integer or whole number, the term independent of *x* does not exist.	M1 for x^0 A1
7(b)(i)	$\left(3+\frac{1}{\sqrt{x}}\right)^7=3^7+\binom{7}{1}(3^6)(\frac{1}{\sqrt{x}})+\binom{7}{2}(3^5)(\frac{1}{\sqrt{x}})^2+...$ $\left(3+\frac{1}{\sqrt{x}}\right)^7=2187+\frac{5103}{\sqrt{x}}+\frac{5103}{x}+...$	M1 A1
7(b)(ii)	Sub $x=4$ $\left(3+\frac{1}{\sqrt{4}}\right)^7=2187+\frac{5103}{\sqrt{4}}+\frac{5103}{4}+...$ $3.5^7=6014.25$	 M1 A1
8(i)	$f'(x)=3\sin 2x+4\cos 2x$ $f''(x)=6\cos 2x-8\sin 2x$ $f(x)=\frac{-3\cos 2x}{2}+\frac{4\sin 2x}{2}$ $f(x)=2\sin 2x-\frac{3}{2}\cos 2x$	B1 B1
8(ii)	At stationary, $f'(x)=0$ $3\sin 2x+4\cos 2x=0$ $\tan 2x=-\frac{4}{3}$ (2^{nd} & 4^{th}) $\alpha=0.927295$ $2x=\pi-\alpha, 2\pi-\alpha$ $x=1.11, 2.68$	M1 M1 A1
8(iii)	$f''(1.107)=6\cos 2(1.107)-8\sin 2(1.107)$ $f''(1.107)=-10.0<0$ $f(1.107)=2\sin 2(1.107)-\frac{3}{2}\cos 2(1.107)$ $f(1.107)=2.50$ (1.11, 2.50) is a max point	M1 A1

	$f''(2.6779) = 6\cos 2(2.6779) - 8\sin 2(2.6779)$ $f''(2.6779) = 10.0 > 0$ $f(2.6779) = 2\sin 2(2.6779) - \frac{3}{2}\cos 2(2.6779)$ $f(2.6779) = -2.50$ (2.68, –2.50) is a min point	M1 A1
9(i)	By long division, $\frac{2x+1}{x-3} = 2 + \frac{7}{x-3}$	M1 Accept other method A1
9(ii)	$y = (2x+1)\ln(x-3)$ $\frac{dy}{dx} = (2x+1)[\frac{1}{x-3}] + \ln(x-3)[2]$ $\frac{dy}{dx} = \frac{2x+1}{x-3} + 2\ln(x-3)$	M1 for Product Rule A1
9(iii)	$\int \frac{2x+1}{x-3} + 2\ln(x-3)dx = (2x+1)\ln(x-3) + d$ $\int 2 + \frac{7}{x-3}dx + 2\int \ln(x-3)dx = (2x+1)\ln(x-3) + d$ $2x + 7\ln(x-3) + 2\int \ln(x-3)dx = (2x+1)\ln(x-3) + d$ $2\int \ln(x-3)dx = (2x+1)\ln(x-3) - 2x - 7\ln(x-3) + d$ $\int \ln(x-3)dx = \frac{1}{2}[(2x-6)\ln(x-3) - 2x] + c$ $\int \ln(x-3)dx = (x-3)\ln(x-3) - x + c$	M1 for reverse process M1 for integration M1 for simplification A1
10(i)	$\cos\theta = \frac{CX}{3}$ $CX = 3\cos\theta$ $\sin\theta = \frac{DX}{4}$ $DX = 4\sin\theta$	M1 for either *CX* or *DX* A1



	$CD = CX + DX$ $CD = 3\cos\theta + 4\sin\theta$	
10(ii)	$R = \sqrt{3^2 + 4^2}$ $\alpha = \tan^{-1}\dfrac{4}{3}$ α = 0.927295 or 53.13° $CD = 5\cos(\theta - 0.927)$ or $5\cos(\theta - 53.1°)$	M1 for either R or α A1
10(iii)	Max CD = 5 At $\theta - 0.927 = 0$ $\theta = 0.927$ or 53.13°	B1 B1
10(iv)	$5\cos(\theta - 0.927) = 4$ $\cos(\theta - 0.927) = \dfrac{4}{5}$ (1st and 4th) $\alpha = 0.6435011$ or 36.87° $\theta - 0.927 = -\alpha, \alpha$ or $\theta - 36.87° = -\alpha, \alpha$ $\theta = 0.284, 1.57$ or $\theta = 16.2°, 90.0°$	M1 A1
11(i)	At B, y = 0 $p + 0 - 4 = 0$ $p = 4$ B = (4, 0)	B1
11(ii)	By ratio, m = 4 – 6 = –2 n = 4 – 5 = –1 A = (–2, –1)	B1 B1
11(iii)	Area of $ABCD$ = $\dfrac{1}{2}\begin{vmatrix} -2 & 4 & 6 & 0 & -2 \\ -1 & 0 & 5 & 4 & -1 \end{vmatrix}$ $= \dfrac{1}{2}[(0 + 20 + 24 + 0) - (-4 + 0 + 0 - 8)]$ $= \dfrac{1}{2}[44 + 12]$ = 28 units^2	M1 A1
11(iv)	Gradient of AC = $\dfrac{5 - (-1)}{6 - (-2)}$	M1

	Gradient of *AC* = $\frac{3}{4}$ Eqn of *BD*: $y=-x+4$ Gradient of *BD* = –1 Since $\frac{3}{4}\times(-1)\neq -1$, the diagonals *AC* and *BD* are not perpendicular to each other.	A1
12(i)	$P=2x+2y+\pi(\frac{1}{2}x)+\pi(\frac{1}{2}y)$ $P=2(x+y)+\frac{\pi}{2}(x+y)$ $P=(\frac{\pi}{2}+2)(x+y)$ Given $P=\frac{\pi}{2}+2$: $\frac{\pi}{2}+2=(\frac{\pi}{2}+2)(x+y)$ $x+y=1$ $y=1-x$	M1 for correct perimeter A1
12(ii)	$A=xy+\frac{1}{2}\pi(\frac{x}{2})^2+\frac{1}{2}\pi(\frac{y}{2})^2$ $A=x(1-x)+\frac{1}{8}\pi x^2+\frac{1}{8}\pi(1-x)^2$ $A=x-x^2+\frac{1}{8}\pi x^2+\frac{1}{8}\pi(1-2x+x^2)$ $A=x-x^2+\frac{1}{8}\pi x^2+\frac{1}{8}\pi-\frac{1}{4}\pi x+\frac{1}{8}\pi x^2$ $A=(\frac{1}{4}\pi-1)x^2+(1-\frac{1}{4}\pi)x+\frac{1}{8}\pi$	M1 for correct area M1 for expansion or factorisation A1
12(iii)	$\frac{\mathrm{d}A}{\mathrm{d}x}=2(\frac{\pi}{4}-1)x+1-\frac{\pi}{4}$ At min *A*, $\frac{\mathrm{d}A}{\mathrm{d}x}=0$ $2(\frac{\pi}{4}-1)x+1-\frac{\pi}{4}=0$ $x=\frac{\frac{\pi}{4}-1}{2(\frac{\pi}{4}-1)}$ $x=\frac{1}{2}$ $A=(\frac{1}{4}\pi-1)x^2+(1-\frac{1}{4}\pi)x+\frac{1}{8}\pi$	M1 A1

<table>
<tr><td></td><td>$A=(\frac{1}{4}\pi-1)(\frac{1}{2})^2+(1-\frac{1}{4}\pi)(\frac{1}{2})+\frac{1}{8}\pi$
$A=\frac{1}{4}(\frac{\pi}{4}+1)$ m^2
$\frac{d^2A}{dx^2}=2(\frac{\pi}{4}-1)<0$
Area is max at $x=\frac{1}{2}$ m</td><td>A1
M1
A1</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td>13(i)</td><td>$y=px^q$
$\lg y=q\lg x+\lg p$
<table>
<tr><td>lg x</td><td>0.08</td><td>0.15</td><td>0.20</td><td>0.26</td><td>0.30</td></tr>
<tr><td>lg y</td><td>0.64</td><td>0.77</td><td>0.89</td><td>1.04</td><td>1.08</td></tr>
</table>
</td><td>B1 for correct points
B1 for best fit line</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td>13(ii)</td><td>The incorrect reading of y is 10.98.
The correct reading should be 9.72.</td><td>B1
B1 Accept 9.55 – 10.47</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td>13(iii)</td><td>Y-intercept is $\lg p=0.48$
p = 3.02
Gradient = $\frac{0.885-0.635}{0.204-0.079}$
q = 2</td><td>M1
A1 Accept p = 2.5 – 3.5
M1
A1 Accept q = 1.5 – 2.5</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td>13(iv)</td><td>When y = 5, lg y = 0.70
From graph, lg x = 0.115
x = 1.30</td><td>M1
A1 Accept x = 1.27 –1.33</td></tr>
</table>