UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
Cambridge International Level 3 Pre-U Certificate
Principal Subject

Mathematics **9794/01**

Paper 1 **For Examination from 2012**

MARK SCHEME

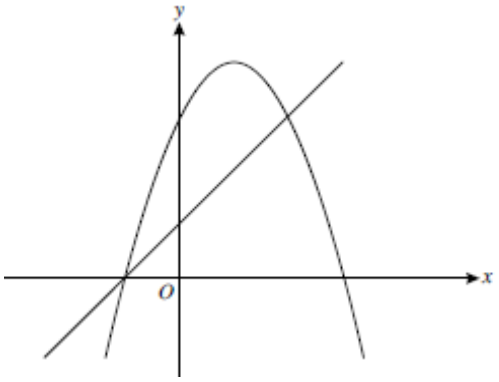
Maximum Mark : 80

IMPORTANT NOTICE

Mark Schemes have been issued on the basis of **one** copy per Assistant examiner and **two** copies per Team Leader.

1		Centre (–5, 3) Radius 6	B1 B1
2	**(i)**	Show f(2)=0	B1
	(ii)	Method shown e.g. division to get quadratic Obtain two factors or roots $(x-2)(2x-3)(x+3)$ $x = 2,\ \frac{3}{2},\ -3$ (follow through *their* factors)	M1 A1 A1 B1 ft
3	**(i)**	Attempt $S_{40} = \frac{40}{2}\{2\times 7 + (40-1)d\}$ Obtain correct unsimplified expression Equate attempt at S_{40} to 4960 and attempt to find *d*. Obtain *d* = 6	M1 A1 M1 A1
	(ii)	Attempt use of $S_\infty = \frac{a}{1-r}$ Obtain 20	M1 A1
4	**(i)**	Form the equations $2r + r\theta = 40$ and $\frac{1}{2}r^2\theta = 100$	B1 B1
	(ii)	Use $\theta = \frac{200}{r^2}$, or equivalent, to eliminate θ Obtain $r^2 - 20r + 100 = 0$ Answer given Solve quadratic for *r* Obtain correct value *r* = 10 Substitute and obtain correct value θ = 2	M1 A1 M1 A1 A1
5	**(i)**	Attempt integration to obtain at least one ln term Obtain ln(*x* – 2) – ln(2*x* + 3) Obtain $\ln\frac{x-2}{2x+3}$ + *c*	M1 A1 A1 A1
	(ii)	$u = \ln x$ $\quad \frac{dv}{dx} = x^2$ $\frac{du}{dx} = \frac{1}{x}$ $\quad v = \frac{x^3}{3}$ Obtain and expression of the form $f(x) \pm \int g(x)dx$ Obtain $\frac{x^3\ln x}{3} - \int \frac{x^3}{3}\times\frac{1}{x}dx$ Obtain $\frac{x^3\ln x}{3} - \frac{x^3}{9} + (c)$ n.b. Mark for + *c* may be awarded in this part if withheld in **(i)**.	M1 M1 M1 A1 A1

6	**(i)**	Obtain $1 - 18x$ Attempt binomial expansion of at least one more term with each term product of binomial coefficient and power of $-2x$ Obtain $144x^2$ Obtain $-672x^3$	B1 M1 A1 A1
	(ii)	Multiply together two relevant pairs of terms Obtain $144 - 18a = 66$ Obtain $a = \frac{37}{3}$	M1 A1ft A1
7		Attempt use of correct Newton-Raphson formula with appropriate f(x) Use e.g. $f'(x) = 1 - \frac{2}{(x+1)^3}$ Use $x_0 = 2$ and continue until at least 2 iterates agree. Obtain final answer 1.879	M1 B1 M1 A1
8	**(i)**	Attempt to differentiate Obtain $6x^2 - 10x - 4$	M1 A1
	(ii)	Setting *their* $\frac{dy}{dx} = 0$ Solving quadratic to obtain $x = 2 \quad x = -\frac{1}{3}$	M1 A1
	(iii)	Looks at sign of $\frac{d^2y}{dx^2}$, derived correctly from *their* $\frac{dy}{dx}$, or other correct method When $x = 2$, $\frac{d^2y}{dx^2} > 0$ therefore minimum When $x = -\frac{1}{3}$, $\frac{d^2y}{dx^2} < 0$ therefore maximum	M1 A1 A1

9	**(i)**	 Parabola correct Line correct	 B1 B1
	(ii)	Equating and attempting to solve equation Obtain $x = -1$ and $x = 2$ *EITHER*: Attempt subtraction f(x) – g(x) in the correct order Obtain $2 + x - x^2$ Attempt integration of their difference Obtain $2x - \frac{1}{2}x^2 - \frac{1}{3}x^3$ Use limits correctly Obtain $4\frac{1}{2}$ *OR*: Attempt $\int (3 + 2x - x^2)\,dx$ Obtain $3x + x^2 - \frac{1}{3}x^3$ Use limits correctly Obtain 9 Calculate area of triangle as $\frac{1}{2} \times 3 \times 3 = 4\frac{1}{2}$ Subtract to obtain area between curve and line as $4\frac{1}{2}$	M1 A1 M1 A1 M1 A1 M1 A1 M1 A1 M1 A1 M1 A1
10	**(i)**	Find **a** – **b** or **b** – **a** Use correct method to find the magnitude of any vector $\sqrt{154}$ or equivalent	M1 M1 A1
	(ii)	Using ($\overrightarrow{AO}$ or $\overrightarrow{OA}$) and ($\overrightarrow{AB}$ or $\overrightarrow{BA}$) $\cos\theta = \frac{\text{scalar product of any two vectors}}{\text{product of their moduli}}$ 32.8° or better, or 0.572 rad or better	B1 M1 A1

11		Separate variables prior to integration	M1
		$\int \frac{1}{\sec y}\,\mathrm{d}y = \int \frac{1}{x^2}\,\mathrm{d}x$	A1
		$\sin y = -\frac{1}{x}$ (+ c)	A1
			A1
		Substitute in $y = \frac{\pi}{6}$ and $x = 4$ to get $c = \frac{3}{4}$	M1
		$y = \sin^{-1}\left(\frac{3}{4} - \frac{1}{x}\right)$ o.e.	A1
12		Attempt expression of $\cos\theta + \sqrt{2}\sin\theta$ in any of the forms $R\cos(\theta \mp \alpha)$ or $R\sin(\theta \pm \alpha)$	M1
		Obtain e.g. $R\cos\alpha = 1$	A1
		And $R\sin\alpha = \sqrt{2}$	A1
		Solve to obtain $R = \sqrt{3}$	A1
		And e.g. $\alpha = 54.7^\circ$ or 0.955 rad	A1
		Attempt to link at least one critical value with a value of θ	M1
		State that $\sqrt{3}$ corresponds to $\theta = 54.7^\circ$ or 0.955 rad	A1
		State that $-\sqrt{3}$ corresponds to $\theta = 234.7^\circ$ or 4.097 rad	A1
		Identify maximum as $\frac{1}{2-R}$ and/or minimum as $\frac{1}{2+R}$	M1
		State maximum as $\frac{1}{2-\sqrt{3}}$, o.e., and 234.7° o.e.	A1
		State minimum as $\frac{1}{2+\sqrt{3}}$, o.e., and 54.7° o.e.	A1