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.

---

1 The expansion of $(2x-y)^3$ is

(A) $8x^3-4x^2y+4xy^2-y^3$

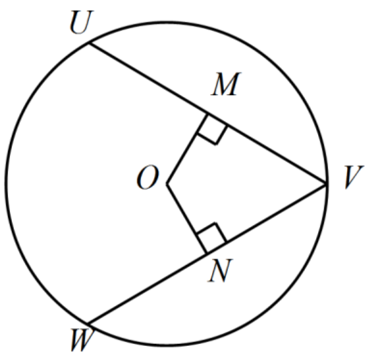
(B) $8x^3-12x^2y+6xy^2-y^3$

(C) $8x^3-4x^2y-2xy^2-y^3$

(D) $8x^3-12x^2y-6xy^2+y^3$

2 O is the centre of the circle. If $OM = ON$, which of the following is true?

(I) $UV=VW$
(II) $MV=NV$



(A) (I) only

(B) (II) only

(C) Both (I) and (II).

(D) Neither (I) nor (II).

3 The exact value of $\tan\left(\sin^{-1}\left(\frac{-2}{3}\right)\right)$ is:

(A) $\frac{-2}{\sqrt{5}}$

(B) $\frac{2}{\sqrt{5}}$

(C) $\frac{-2}{3}$

(D) $\frac{2}{5}$

4 $\int \frac{2}{\sqrt{4-25x^2}}\, dx$ is:

(A) $\frac{2}{5}\sin^{-1}\frac{x}{2}+C$

(B) $\frac{2}{5}\sin^{-1}\frac{5x}{2}+C$

(C) $\frac{2}{5}\sin^{-1}\frac{x}{10}+C$

(D) $2\sin^{-1}\frac{2x}{5}+C$

5 A particle moves in a straight line such that its velocity, v is given by $v=\cos 2x$ when at displacement x from the origin O.
The acceleration of the particle is given by

(A) $-2\sin 2x$

(B) $-\sin 2x\cos 2x$

(C) $\frac{1}{2}\sin 2x$

(D) $-\sin 4x$

6 The horizontal asymptote of the function $y = \frac{2x^2-4x+3}{3x^2-5}$ is

(A) $y=-\frac{3}{5}$

(B) $y=\frac{2}{3}$

(C) $y=0$

(D) $y=2$

7 The number of solutions of the equation $\cos 3x = -0.5$ for $0 \le x \le 2\pi$ is

(A) 1

(B) 2

(C) 3

(D) 6

8 At a certain instant, a sphere is of radius 10 cm and the radius is increasing at a rate of 2 cm/s. The rate of increase of the volume of the sphere, in cm^3/s is

(A) 80π

(B) $\frac{800\pi}{3}$

(C) 800π

(D) 400π

9 The point P divides the interval from $A(-1,4)$ to $B(3,7)$ externally in the ratio $5:2$.

What is the y co-ordinate of P ?

(A) 2

(B) 6

(C) $6\frac{1}{7}$

(D) 9

10 When the polynomial $x^3 + 2x^2 - 3x + k$ is divided by $(x+2)$, the remainder is 3. The value of k is:

(A) -3

(B) -7

(C) 9

(D) 13

Section II

60 marks
Attempt Questions 11-14
Allow about 1 hours and 45 minutes for this section.

Answer each question in the appropriate writing booklet. Extra booklets are available.
In Questions 11 – 14, your responses should include relevant mathematical reasoning and/or calculations.

Question 11. (15 marks). Use a **Separate** Booklet. **Marks**

(a) Factorise $8x^3 - y^3$. **1**

(b) Find the constant term in the expansion of $\left(x^2 + \dfrac{3}{x}\right)^6$. **2**

(c) Given $f(x) = \dfrac{1}{7-x}$,

(i) Find $f^{-1}(x)$. **1**

(ii) State the domain of $f^{-1}(x)$. **1**

(iii) State the range of $f^{-1}(x)$. **1**

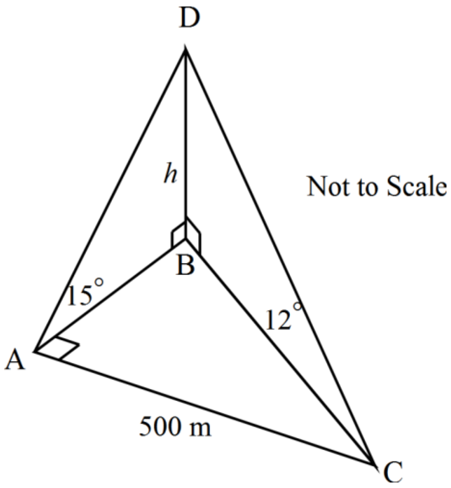
(d) Solve $\dfrac{x^2 - 4}{x} > 0$ **3**

Question 11 continued on next page.

(e) Evaluate $\int_{1}^{\sqrt{2}} x\sqrt{x^2-1}\ dx$ using the substitution $u = x^2 - 1$. **3**

(f) From a point A, the top of a tower BD, which is directly north of A, has an angle of elevation of 15°. After walking 500 metres on a bearing of 090°, the top of the tower has an angle of elevation of 12°. **3**

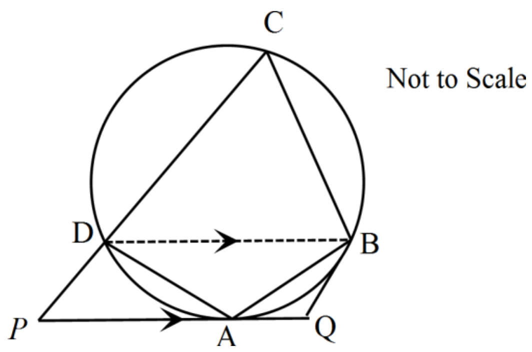
Find the height of the tower, to the nearest metre.



Question 12. (15 marks) Use a **Separate** Booklet. **Marks**

(a) Prove $\tan^{-1}\left(\frac{1}{4}\right)+\tan^{-1}\left(\frac{3}{5}\right)=\frac{\pi}{4}$. **3**

(b)



Let *ABCD* be a cyclic quadrilateral. The tangents from *Q* touch the circle at *A* and *B*. The diagonal *DB* is a parallel to the tangent *AQ* and *QA* produced intersects with *CD* produced at P. Copy this diagram into your booklet.

Let $\angle QAB=\alpha$.

(i) Prove that ΔBAD is isosceles. **2**

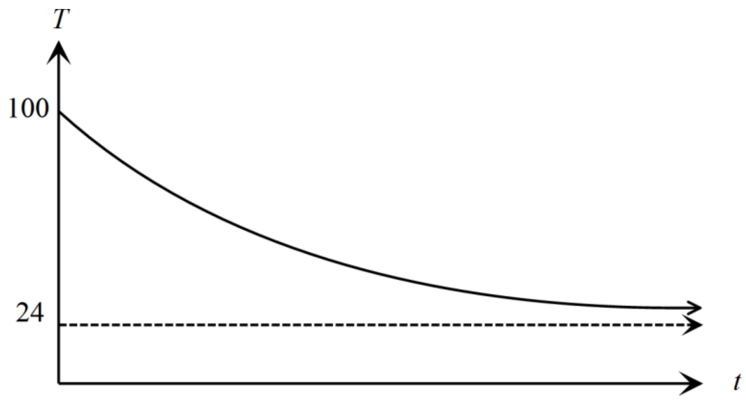
(ii) Explain why $\angle BCD=2\alpha$. **2**

(iii) Show that *P*,*Q*, *B* and *C* are concyclic points. **2**

Question 12 continued on next page.

(c) The graph below represents the relationship between T, the temperature in $°C$ of a cooling cup of tea, and t, the time in minutes.

The rate of cooling of this tea is given by $\frac{dT}{dt} = -k\left(T - A\right)$ where k and A are constants and $k > 0$.



(i) Show that $T = A + Be^{-kt}$ is a solution to the differential equation where B is a constant. **1**

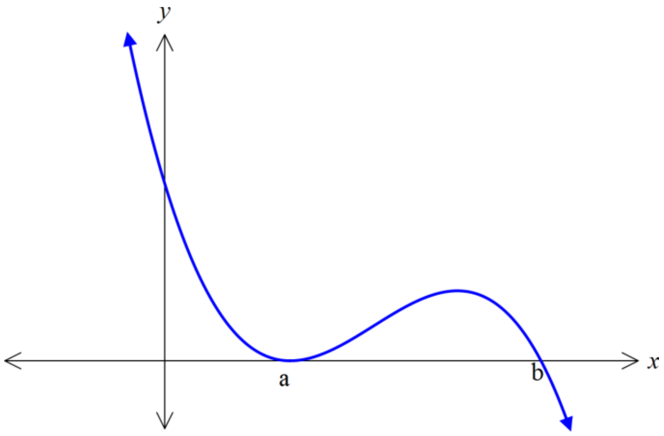
(ii) By considering the graph at $t = 0$ and when $t \to \infty$, find the values of A and B. **2**

(iii) If the temperature of the tea is $40°C$ after 75 minutes, show that $k = -\frac{1}{75}\ln\left(\frac{4}{19}\right)$. **2**

(iv) Hence, find the rate at which the tea is cooling after 75 minutes. **1**

Question 13. (15 marks) Use a **Separate** Booklet. **Marks**

(a) The graph of a polynomial, $P(x)$ is shown below. **1**
Write down a possible equation for $P(x)$.



(b) The polynomial equation $x^3 - 11x^2 + cx - 36 = 0$ has 3 positive roots. One root is the product of the other two roots.

(i) Show that 6 is a root of the polynomial **2**

(ii) Hence, find the value of c. **2**

(c) Consider the function $f(x) = x^2 + 3\ln(x-2)$

(i) By sketching $y = -x^2$ and $y = 3\ln(x-2)$ on the same axes, show that $f(x) = 0$ has exactly one solution, α, where $2 < \alpha < 3$. **3**

(ii) Taking $x = 2\cdot 2$ as the first approximation, use one application of Newton's method to find a second approximation to α. Give your answer to 3 decimal places. **2**

(d) (i) Show that the equation of the normal to the parabola $x^2 = 16y$ at the point $P(8p, 4p^2)$ is given by $x + py = 8p + 4p^3$. **2**

(ii) Find, in terms of p, the distance SN, where S is the focus of the parabola and N is the point where the normal intersects the y-axis. **2**

(iii) Hence find the area of ΔPSN in terms of p. **1**

Question 14. (15 marks) Use a **Separate** Booklet. **Marks**

(a) $f(x) = \cos^{-1}(\cos x), -\pi \le x \le \pi.$

(i) Differentiate $f(x)$ and hence find the possible values of $f'(x)$. **3**

(ii) Hence or otherwise, sketch $f(x)$. **1**

(b) The temperature $T°C$ of an unheated building is modelled using the equation
$T = 23 + 2\cos\left(\frac{\pi t}{12}\right) + 5\sin\left(\frac{\pi t}{12}\right),\ 0 \le t \le 24$ where t is the number of hours after midday.

(i) Express $2\cos\theta + 5\sin\theta$ in the form $R\cos(\theta - \alpha)$, where $R > 0$ and $0 < \alpha < \frac{\pi}{2}$. **2**
Give the values of R and α to 3 significant figures.

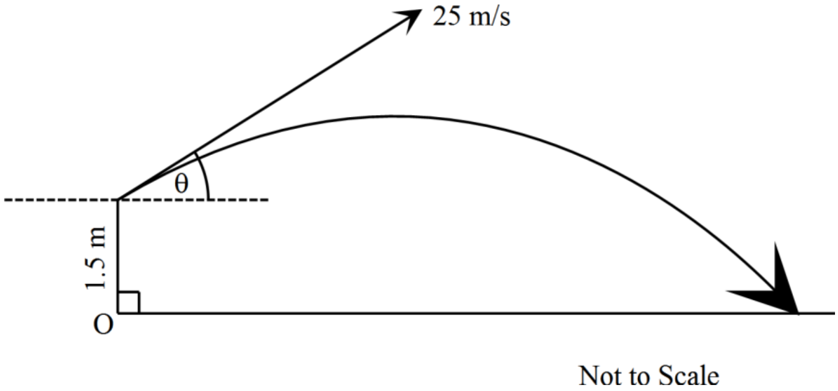
(ii) Hence, calculate the minimum temperature of the building and the time when this minimum occurs. **2**

Question 14 continued on next page.

(c) An athlete releases a javelin with speed 25 m/s at an angle θ to the horizontal from a height 1.5 m above the ground.

Take the origin to be the point on the ground directly below the point of release, as shown. You may assume the horizontal position of the javelin, at time t, is given by $x = 25t\cos\theta$. DO NOT PROVE THIS.

(take $g = 10\,ms^{-2}$).



(i) Show that the height, y of the javelin at time t is given by **2**

$$y = -5t^2 + 25t\sin\theta + 1.5\,.$$

(ii) The school record for the javelin throw is 60 m. Show that the athlete achieves a school record throw when **3**

$$288\tan^2\theta - 600\tan\theta + 273 = 0\,.$$

(iii) Hence, calculate in what range θ must lie for the athlete to exceed the school record. **2**

End of Paper

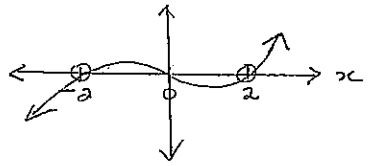
MATHEMATICS EXT 1 – TRIAL 2013

SOLUTIONS

1. B
2. C
3. A
4. B
5. D
6. B
7. D
8. C
9. D
10. A

d) $x^2 \times \quad \dfrac{x^2-4}{x} > 0 \quad \times x^2$

$x(x-2)(x+2) > 0$ — 1



— 1

$\therefore \quad -2 < x < 0, \quad x > 2$ — 1

Alternative

QUESTION 11

(a) $8x^3 - y^3 = (2x)^3 - y^3$ — 1m R/W.

$= (2x-y)(4x^2 + 2xy + y^2)$

(b) $\left(x^2 + \dfrac{3}{x}\right)^6$

General term $= {}^6C_k \,(x^2)^{6-k}\left(\dfrac{3}{x}\right)^k$

$= {}^6C_k \; x^{12-2k}\, 3^k \,x^{-k}$

$= {}^6C_k \; x^{12-3k}\, 3^k$

For constant term, $12 - 3k = 0$

$k = 4$ — 1

$\therefore$ constant term $= {}^6C_4 \cdot 3^4$

$= 1215$ — 1

QUESTION 11 (CONT)

(c) (i) For inverse $x = \dfrac{1}{7-y}$

$7x - xy = 1$

$xy = 7x - 1$

$y = \dfrac{7x-1}{x}$

$\therefore \quad f^{-1}(x) = \dfrac{7x-1}{x}$ — 1 R/W.

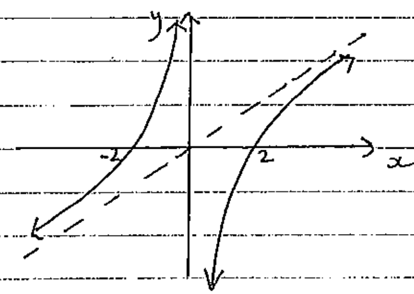
(ii) domain $f^{-1}(x)$: all real $x \neq 0$ — 1m R/W

(ii) range $f^{-1}(x)$: all real $y \neq 7$ — 1m R/W.

(d) $\dfrac{x^2-4}{x} > 0$

Consider $y = \dfrac{x^2-4}{x}$

$= x - \dfrac{4}{x}$



From graph $\dfrac{x^2-4}{x} > 0$ when $x > 2$ or $-2 < x < 0$

1 – critical values
1 – test/graph
1 – solution.

or Critical points when $x = 0$

or $\dfrac{x^2-4}{x} = 0$

$x = \pm 2$

×	✓	×	✓
	-2	0	2

Test $x = -3$ LHS $= \dfrac{5}{-3} < 0$ FALSE $\therefore$ Solution

$x = -1$ LHS $= 3 > 0$ TRUE $-2 < x < 0$ or

$x = 1$ LHS $= -3 < 0$ FALSE $x > 2$

QUESTION 11 (CONT)

(e) $\displaystyle\int_1^{\sqrt{2}} x\sqrt{x^2-1}\,dx$

Let $u = x^2-1$ When $x=1$ $u=0$

$\dfrac{du}{dx} = 2x$ $x=\sqrt{2}$ $u=1$

$du = 2x\,dx$

$\therefore \displaystyle\int_1^{\sqrt{2}} x\sqrt{x^2-1}\,dx$

$= \dfrac{1}{2}\displaystyle\int_1^{\sqrt{2}} \sqrt{x^2-1}\;2x\,dx$

$= \dfrac{1}{2}\displaystyle\int_0^1 u^{1/2}\,du$

1m – correct integral in terms of u
1m – correct limits
1m – integrating + evaluating.

$= \dfrac{1}{2}\left[\dfrac{2u^{3/2}}{3}\right]_0^1$

$= \dfrac{1}{2}\left[\dfrac{2}{3}\right]$

$= \dfrac{1}{3}$

(f) $\tan 15° = \dfrac{h}{AB}$ $\tan 12 = \dfrac{h}{BC}$ – (1)

$AB = h\cot 15°$ $BC = h\cot 12°$

In ΔABC, using Pythagoras $500^2 + h^2\cot^2 15 = h^2\cot^2 12$

$h^2(\cot^2 12 - \cot^2 15) = 500^2$

$h^2 = \dfrac{500^2}{\cot^2 12 - \cot^2 15}$ – (1)

$h^2 = 201167\cdot9589$

QUESTION 12

(a) To prove $\tan^{-1}\left(\frac{1}{4}\right) + \tan^{-1}\left(\frac{3}{5}\right) = \frac{\pi}{4}$

Let $x = \tan^{-1}\frac{1}{4}$ and $y = \tan^{-1}\frac{3}{5}$ $-\frac{\pi}{2} < x, y < \frac{\pi}{2}$

$\tan x = \frac{1}{4}$ $\tan y = \frac{3}{5}$ (1)

Since $\tan x > 0$
$\tan y > 0$
then
$0 < x, y < \frac{\pi}{2}$

Then $\tan(x+y) = \dfrac{\tan x + \tan y}{1 - \tan x \tan y}$

$= \dfrac{\frac{1}{4} + \frac{3}{5}}{1 - \frac{1}{4}\cdot\frac{3}{5}}$

$= \dfrac{\frac{5}{20} + \frac{12}{20}}{1 - \frac{3}{20}}$

$= 1$ (1)

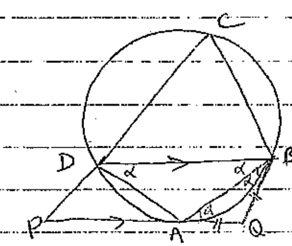
1m – set up + restrictions on domain/range
1m – correct subst $\tan(x+y)$
1m – conclusion.

$\therefore \tan(x+y) = 1$

$x + y = \frac{\pi}{4}$ (since $0 < x+y < \pi$)

$\therefore \tan^{-1}\frac{1}{4} + \tan^{-1}\frac{3}{5} = \frac{\pi}{4}$ as required. (1)

(b)



(2) – both reasons and conclusion
(1) – one reason and conclusion.

(i) $\angle ABD = \angle QAB = \alpha$ (alternate angles on parallel lines $PQ \parallel DB$, equal)
$\angle ADB = \angle QAB = \alpha$ (angle tangent QA makes with chord AB at point of contact equal to angle at circumference in alternate segment)
$\therefore \angle ABD = \angle ADB$ $\therefore \Delta ABD$ isosceles

QUESTION 12 (CONT)

(b) (i) ∴ $AD = AB$ (equal sides opposite equal angles in ΔABD)
∴ ΔABD isosceles

not necessary

$\angle DAB = 180 - \angle ADB - \angle ABD$

(ii) $\angle DAB = 180 - \alpha - \alpha$ (angle sum of $\Delta BAD = 180°$)
$= 180 - 2\alpha$ — ①

$\angle BCD = 180 - \angle DAB$ (opposite angles of cyclic quadrilateral ABCD are supplementary) ①
$= 180 - (180 - 2\alpha)$
$= 2\alpha$ as required.

(iii) $\angle BCD = \angle BCP$ (common)
$= 2\alpha$ (from ii)

$AQ = QB$ (tangents from external point Q to circle at A and B are equal)
∴ ΔBAQ is isosceles.
$\angle QAB = \angle QBA = \alpha$ (angles opposite equal sides in ΔBAQ)

∴ $\angle AQB = 180 - 2\alpha$ (angle sum of $\Delta AQB = 180°$) — ①
$= \angle PQB$ (common)

Then $\angle AQB + \angle PCB$
$= 180 - 2\alpha + 2\alpha$ ①
$= 180$

∴ $\angle PQB$ and $\angle PCB$ are supplementary
∴ PQBC are concyclic (opposite angles in cyclic quadrilateral are supplementary)

QUESTION 12 (CONT)

(c) (i) $T = A + Be^{-kt}$ ①

$\frac{dT}{dt} = -kBe^{-kt}$

From ①, $Be^{-kt} = T - A$ ← must show this or equivalent.

∴ $\frac{dT}{dt} = -k(T - A)$

∴ it is a solution of differential equation.

(ii) When $t = 0$, $T = A + B$ (from ①)
From graph $T = 100$
∴ $A + B = 100$

As $t \to \infty$ $T \to A$ (from ①)
From graph, $T \to 24$

∴ $A = 24$ — ①
$B = 76$ — ①

(iii) $T = 24 + 76e^{-kt}$

When $t = 75$ $T = 40$

$40 = 24 + 76e^{-75k}$ — ①

$\frac{16}{76} = e^{-75k}$

$-75k = \ln\left(\frac{16}{76}\right)$ ①

$k = -\frac{1}{75}\ln\left(\frac{4}{19}\right)$

QUESTION 12 (CONT)

(iv) $\frac{dT}{dt} = -k(T - 24)$

$= -k \times (40-24)$

$= \frac{1}{75}\ln\left(\frac{4}{19}\right) \times 16$

$= \frac{16}{75}\ln\left(\frac{4}{19}\right)$ degrees/minute

$= -0.332$ (3sf) degrees/min.

$\therefore$ rate of cooling 0.332 deg/min. – ①

QUESTION 13

(a) $P(x) = -k(x-a)^2(x-b)$ (any equation of this form) 1m R/W.

or $k(x-a)^2(b-x)$

(b) $x^3 - 11x^2 + cx - 36 = 0$

Roots $\alpha, \beta, \alpha\beta$ $\alpha, \beta > 0$

(i) sum of roots $\alpha+\beta+\alpha\beta = 11$ $(-b/a)$ ①

sum (in pairs) $\alpha\beta + \alpha^2\beta + \alpha\beta^2 = c$ (c/a) ②

sum (in threes) $\alpha^2\beta^2 = 36$ $(-d/a)$ ③

$\therefore$ $\alpha^2\beta^2 = 36$ – ①

$\alpha\beta = 6$ since $\alpha\beta > 0$ – ①

$\therefore$ 6 is a root of polynomial.

(ii) Subst into ① $\alpha+\beta+6 = 11$

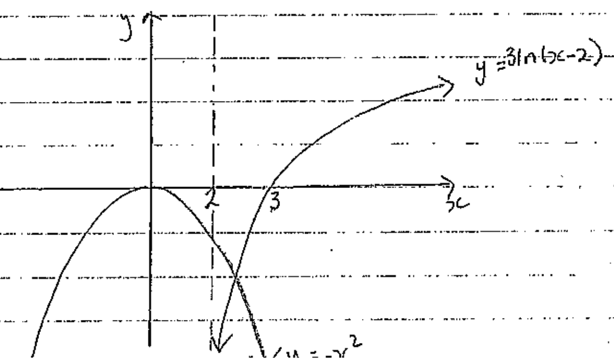
$\alpha+\beta = 5$ – ①

Subst from ②, $\alpha\beta(1+\alpha+\beta) = c$

$6(1+5) = c$

$c = 36$. – ①

(c)



From graph $y=-x^2$ and $y=3\ln(x-2)$ have one point of intersection.

$\therefore$ $3\ln(x-2) = -x^2$ has one root

i.e. $3\ln(x-2)+x^2 = f(x)$ has one zero

i.e. $f(x)=0$ has one solution.

From graph solution lies between 2 and 3

$\therefore$ If $f(\alpha)=0$ $2<\alpha<3$.

(ii) $f(2.2) = 2.2^2 + 3\ln(2.2-2)$

$= 4.84 + 3\ln(0.2)$

$f'(x) = 2x + \dfrac{3}{x-2}$ ①

$f'(2.2) = 4.4 + \dfrac{3}{0.2}$

$= 19.4.$

Using newton's method, second approximation $= x_0 - \dfrac{f(x_0)}{f'(x_0)}$

$= 2.2 - \dfrac{4.84+3\ln(0.2)}{19.4}$

$= 2.19939\ldots$ ①

$= 2.199$ (3dp)

QUESTION 13 (CONT)

(d) (i) $x^2=16y$ at $P(8p, 4p^2)$

$y = \dfrac{x^2}{16}$

$\dfrac{dy}{dx} = \dfrac{x}{8}$

At P, $\dfrac{dy}{dx} = \dfrac{8p}{8} = p$

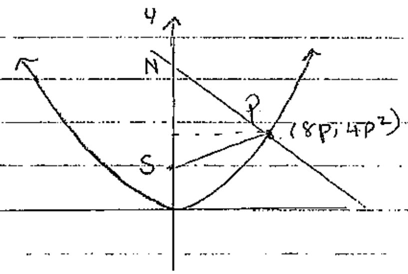
$\therefore$ gradient of normal $= -\dfrac{1}{p}$ – ①

$\therefore$ Eq of normal is

$y-4p^2 = -\dfrac{1}{p}(x-8p)$ – ①

$py - 4p^3 = -x + 8p$

$x + py = 8p + 4p^3$ (as required) ⊛



(ii) $4a = 16$

$a = 4$

$\therefore$ Focus $S = (0,4)$

N is where $x=0$

Subst in ⊛, $py = 8p + 4p^3$

$y = 8 + 4p^2$ – ①

$N = (0, 8+4p^2)$

$\therefore$ $SN = 8+4p^2 - 4$

$= 4+4p^2$ – ①

(iii) area $\Delta PSN = \frac{1}{2} \times b \times h$

$= \frac{1}{2} \times SN \times 8p$ ① R|W

$= 4p(4+4p^2) = 16p(1+p^2)$

QUESTION 14

(a) $f(x) = \cos^{-1}(\cos x) \quad -\pi \leq x \leq \pi$

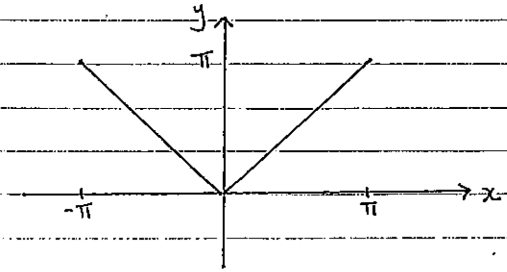
(i) $f'(x) = \dfrac{-1}{\sqrt{1-\cos^2 x}} \times -\sin x$ (1)

$f'(x) = \dfrac{\sin x}{|\sin x|}$ ← few realised $|\sin x|$ ∴ ± 1

$\therefore f'(x) = \begin{cases} 1 & \sin x > 0 \Rightarrow 0 < x < \pi \\ -1 & \sin x < 0 \Rightarrow -\pi < x < 0 \end{cases}$ (1) (1)

$f'(x)$ not defined when $x = 0, \pm\pi$ — not done by many at all. /3

(ii)



most couldn't sketch this at all. /1

(b)(i) $2\cos\theta + 5\sin\theta = R\cos(\theta - \alpha)$

$= R\cos\theta\cos\alpha + R\sin\theta\sin\alpha$

$\therefore R\cos\alpha = 2 \qquad R = \sqrt{2^2 + 5^2}$

$R\sin\alpha = 5 \qquad = \sqrt{29}$

$= 5.39$ (3.s.f.) (1)

$\therefore \tan\alpha = \frac{5}{2}$

$\alpha = 1.19$ (3 s.f) (1)

0.379π ← sig fig checked here. /2

QUESTION 14 (CONT)

(b) (i) $\therefore 2\cos\theta + 5\sin\theta = 5.39\cos(\theta - 1.19)$

(ii) Minimum temp

$T = 23 + 2\cos\frac{\pi t}{12} + 5\sin\frac{\pi t}{12}$

$= 23 + 5.39\cos\left(\frac{\pi t}{12} - 1.19\right)$

Minimum occurs when $\cos\left(\frac{\pi t}{12} - 1.19\right) = -1$

$\therefore$ minimum temp $= 23 - 5.39$

$= 17.61°$ — (1)

$\cos\left(\frac{\pi t}{12} - 1.19\right) = -1$

$\frac{\pi t}{12} - 1.19 = -\pi, \pi, 3\pi \ldots\ldots$

Now $0 \leq t \leq 24$

$-1.19 \leq \frac{\pi t}{12} - 1.19 \leq 5.093$

$\therefore \frac{\pi t}{12} - 1.19 = \pi$ /2

$t = 16.545\ldots$ hours

$=$ 16 hours 33 minutes (nearest min)

$\therefore$ time minimum occurs $= 04{:}33$ (am) (1)

↑ needed

QUESTION 14 (CONT)

(c) (i) $\ddot{y} = -10$

$\dot{y} = -10t + c$

When $t=0$ $\dot{y} = 25\sin\theta$

$\therefore c = 25\sin\theta$

$\dot{y} = -10t + 25\sin\theta$ ①

$y = -5t^2 + 25t\sin\theta + c_1$

When $t=0$ $y = 1.5$

$\therefore c_1 = 1.5$ — ① must have some sub

$\therefore y = -5t^2 + 25t\sin\theta + 1.5$ (*)

/2

(ii) When $x = 60$

$60 = 25t\cos\theta$

$t = \frac{60}{25\cos\theta}$

$t = \frac{12}{5\cos\theta} = \frac{12\sec\theta}{5}$ ①

Subst $t = \frac{12\sec\theta}{5}$ $y=0$ into (*)

$0 = -5\left(\frac{12\sec\theta}{5}\right)^2 + 25\left(\frac{12\sec\theta}{5}\right)\sin\theta + 1.5$

$0 = \frac{-144\sec^2\theta}{5} + 60\tan\theta + 1.5$ ① (x5)

$0 = -144\sec^2\theta + 300\tan\theta + 7.5$ (-x2)

$0 = -288\sec^2\theta + 600\tan\theta + 15$

$0 = -288(\tan^2\theta + 1) + 600\tan\theta + 15$ ①

$0 = -288\tan^2\theta + 600\tan\theta - 273$

$\therefore 288\tan^2\theta - 600\tan\theta + 273 = 0.$

needed SEC to get to 2nd Mark.

/3

QUESTION 14 (CONT)

(c) (iii) $288\tan^2\theta - 600\tan\theta + 273 = 0.$

$\tan\theta = \frac{600 \pm \sqrt{600^2 - 4\times288\times273}}{2\times288}$

$= \frac{600 \pm 24\sqrt{79}}{576}$

$= \frac{25 \pm \sqrt{79}}{24}.$

$\theta = 54.693\ldots$ or $33.8744\ldots$ $(0<\theta \leq 90°)$

$\therefore$ For athlete to exceed school record

$33°53' < \theta < 54°41'$ ✓ — ① correct inequality

/2

my notes

54.69346 33.87445 ↑

1.412008101 0.6713252326

54°41'36.4" 33°52'28.05"

54°41' ↓ ↑ 33°53'

radians 0.95458069 ↓ 0.59122083 ↑