Total marks (84)
Attempt Questions 1 - 7
All questions are of equal value

Answer all questions in a SEPARARTE writing booklet.

QUESTION 1 (12 marks) Use a SEPARATE writing booklet. **Marks**

(a) Factorise $x^3 + 27$. **1**

(b) Draw the graph of the relation $|x + 2y| = 4$. **2**

(c) Find the coordinates of the point which divides the interval joining (2, -1) to (5, 3) *externally* in the ratio 3 : 1. **2**

(d) Solve $\dfrac{3x-1}{x+2} > 4$. **3**

(e) The line $y = 8 - 2x$ cuts the parabola $y = x^2$ at the point (2, 4). Find the acute angle between the line $y = 8 - 2x$ and the tangent to the parabola at (2, 4). **4**

QUESTION 2 (12 marks) Use a SEPARATE writing booklet. **Marks**

(a) Find $\int \frac{x}{\sqrt{16-x^4}}\,dx$ using the substitution $u = x^2$. **3**

(b) Find $\int_0^{\frac{\pi}{4}} \sin^2 2x \, dx$. **3**

(c) Find the exact value of $\sin\left(2\tan^{-1}\frac{2}{3}\right)$. **3**

(d) Consider the function $f(x) = \frac{\pi}{2} + \tan^{-1}(x-1)$.

(i) What is the range of $y = f(x)$? **1**

(ii) Sketch the graph of $y = f(x)$. **2**

QUESTION 3 (12 marks) Use a SEPARATE writing booklet. **Marks**

(a) Write down the general solution of the equation $\cos(\pi x) = \frac{\sqrt{3}}{2}$. **2**

(b) Using the expansion the expansion of $\sin(A+B)$, find the exact value of $\sin 105°$. **2**

(c) Sketch the graph of $y = \sec x$ for $0 \le x \le 2\pi$. **2**

(d) (i) Express $6\sin\theta - 8\cos\theta$ in the form $R\sin(\theta - \alpha)$ where $R > 0$ and θ and α are in degrees. **2**

(ii) Hence solve the equation $6\sin\theta - 8\cos\theta = 4$ for $0° \le \theta \le 360°$. **2**

(iii) What is the minimum value of $6\sin\theta - 8\cos\theta$, and what is the least positive value of θ for which it occurs? **2**

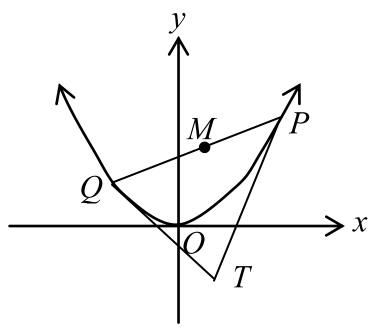
QUESTION 4 (12 marks) Use a SEPARATE writing booklet. **Marks**

(a) A parabola has equation $8ay = x^2 - 4ax - 20a^2$.

(i) By expressing the equation in the form $(x-h)^2 = 4A(y-k)$, find the coordinates of the vertex. **2**

(ii) Write down the equation of the directrix. **1**

(b)



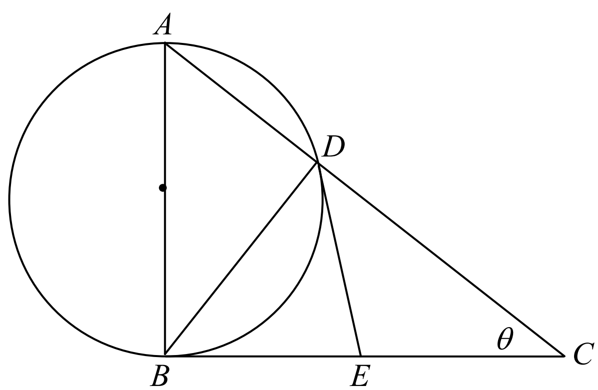
The points $P(4p, 2p^2)$ and $Q(4q, 2q^2)$ lie on the parabola $x^2 = 8y$

(i) Show that the equation of the tangent at P is $px - y - 2p^2 = 0$. **2**

(ii) Find the coordinates of the point of intersection T of the tangents at P and Q. **3**

(iii) If M is the midpoint of the chord PQ, show that TM is parallel to the axis of the parabola. **1**

(c)

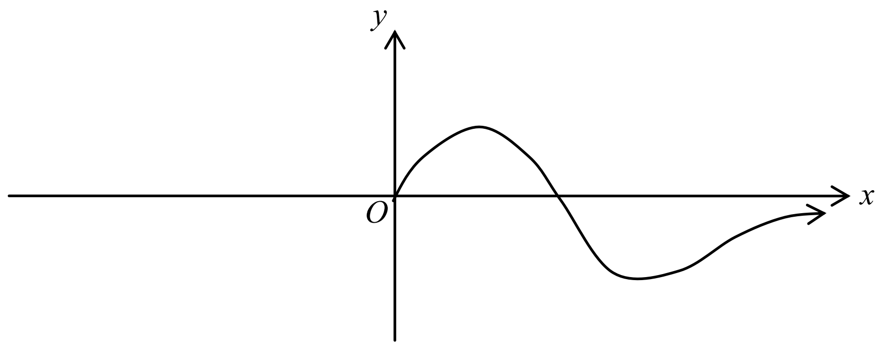


In the diagram, AB is a diameter of the circle, and CB and ED are tangents to the circle. $\angle ECD = \theta$. **3**

Copy or trace this diagram into your writing booklet.
Prove that $\angle DEB = 2\theta$.

QUESTION 5 (12 marks) Use a SEPARATE writing booklet. **Marks**

(a)



The diagram shows part of the graph of the function $y = P(x)$ where $P(x)$ is an odd function. **2**

Copy or trace the diagram into your writing booklet and complete the graph of $y = P(x)$, given that it is an odd function.

(b) $(x-1)$ and $(x+2)$ are factors of $P(x) = x^3 + 4x^2 + ax + b$.

(i) Find the values of a and b. **2**

(ii) What is the third factor of $P(x)$? **1**

(c) For the polynomial equation $P(x) = 0$ where $P(x) = x^3 - 5x + 3$, there is a root between $x = 1$ and $x = 2$.

(i) Determine if the root lies between 1 and 1.5 or between 1.5 and 2. **1**

(ii) Taking $x = 1.5$ as an approximation to the root, use Newton's method once to find a second approximation to the root. **2**

(d) Using the Principle of Mathematical Induction, prove that, for all positive integers n, $5^n + 2 \times 11^n$ is a multiple of 3. **4**

QUESTION 6 (12 marks) Use a SEPARATE writing booklet. **Marks**

(a) Boyle's Law in Physics states that, for a gas at constant temperature, the volume of a gas is inversely proportional to its pressure. **3**
For a particular gas at a particular temperature, the pressure (P kilopascals) and its volume (Vcm³) are related by the formula:

$$PV = 3000$$

If the volume of gas is increasing at a rate of 30cm³/minute, find the rate at which the pressure is decreasing when the volume is 100cm³.

(b) A tank contains a brine solution for curing hams. (Brine is salt dissolved in water.)
Initially the tank contains 80kg of dissolved salt.
The amount of salt in the solution is known to change at a rate, in kg/minute,
given by: $$\frac{dM}{dt} = -0.01(M - 50)$$

(i) Show that $M = 50 + Ae^{-0.01t}$ satisfies the equation. **1**

(ii) Show that $A = 30$. **1**

(iii) Find the amount of salt in the tank after 60 minutes. **1**

(iv) What is the least amount of salt that will remain in the solution? **1**

(c) A particle moves in Simple Harmonic Motion with a period of 6 seconds, and an amplitude of 20cm.

(i) Write an equation for its motion in the form $x = A\sin nt$. **2**

(ii) Find the maximum velocity of the particle. **1**

(iii) Find its distance from the centre of oscillation when its velocity is half its maximum velocity. **2**

QUESTION 7 (12 marks) Use a SEPARATE writing booklet. **Marks**

(a) Find, as an integer, the coefficient of x^3 in the expansion of $\left(x - \frac{2}{x^2}\right)^9$. **2**

(b) A particle is moving in a straight lie. Its velocity vm/s at position x metres is given by:

$$v = \frac{5}{x} \text{ for } x > 0.$$

Initially, $x = 10$.

(i) Find the acceleration when $x = 2$. **3**

(ii) Find an expression for x in terms of t. **3**

(c) A particle is projected from ground level at an angle θ to the horizontal, with a speed of V. g is the acceleration due to gravity.
Its position at time t is given by the equations:

$$x = Vt\cos\theta, \qquad y = Vt\sin\theta - \frac{1}{2}gt^2$$

(i) Find the maximum height reached, in terms of V and θ, in simplest form. **3**

(ii) What is the speed of the object at its maximum height? **1**

End of paper

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STANDARD INTEGRALS

$$\int x^n \, dx = \frac{1}{n+1} x^{n+1}, \quad n \neq -1; \quad x \neq 0, \text{if } n < 0$$

$$\int \frac{1}{x} \, dx = \ln x, \quad x > 0$$

$$\int e^{ax} \, dx = \frac{1}{a} e^{ax}, \ a \neq 0$$

$$\int \cos ax \, dx = \frac{1}{a} \sin ax, \quad a \neq 0$$

$$\int \sin ax \, dx = -\frac{1}{a} \cos ax, \ a \neq 0$$

$$\int \sec^2 ax \, dx = \frac{1}{a} \tan ax, \ a \neq 0$$

$$\int \sec ax \ \tan ax \, dx = \frac{1}{a} \sec ax, \ a \neq 0$$

$$\int \frac{1}{a^2 + x^2} \, dx = \frac{1}{a} \tan^{-1} \frac{x}{a}, \ a \neq 0$$

$$\int \frac{1}{\sqrt{a^2 - x^2}} \, dx = \sin^{-1} \frac{x}{a}, \ a > 0, \ -a < x < a$$

$$\int \frac{1}{\sqrt{x^2 - a^2}} \, dx = \ln\left(x + \sqrt{x^2 - a^2}\right), \quad x > a > 0$$

$$\int \frac{1}{\sqrt{x^2 + a^2}} \, dx = \ln\left(x + \sqrt{x^2 + a^2}\right)$$

NOTE: $\ln x = \log_e x, \quad x > 0$

Extension One Mathematics

Trial HSC Examination 2006

- Markers Comments + Worked Solutions
- Dot plots

Mathematics Extension 1: Question 1

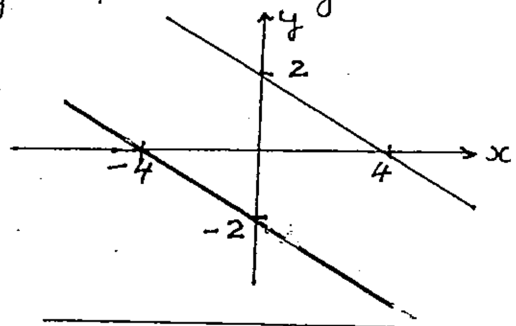
Suggested Solutions	Marks Awarded	Marker's Comments

(a) $x^3 + 27 = (x+3)(x^2 - 3x + 9)$ 1

Well done

(b) $|x + 2y| = 4$

$x + 2y = -4$ or $x + 2y = 4$



2

Poorly answered.
All sorts of graphs were presented.
1 Mark awarded for each.

(c)
$$\begin{array}{cccccc} x_1 & y_1 & x_2 & y_2 & m_1 & m_2 \\ (2, & -1) & (5, & 3) & 3 : & -1 \end{array}$$

$$\left(\frac{3\times 5 + (-1)\times 2}{3 + (-1)}, \frac{3\times 3 + (-1)\times(-1)}{3 + (-1)}\right)$$

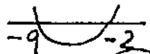
$$\left(6\tfrac{1}{2}, 5\right)$$

2

1 Mark for correct substitution into formula
1 Mark for answer

(d) $$\frac{3x-1}{x+2} > 4$$

$$\times (x+2)^2: \quad (3x-1)(x+2) > 4(x+2)^2$$
$$4(x+2)^2 - (3x-1)(x+2) < 0$$
$$(x+2)[4(x+2) - (3x-1)] < 0$$
$$(x+2)(x+9) < 0$$
$$-9 < x < -2$$



3

1 Mark multiplying through by $(x+2)^2$
1 Mark factorisation
1 Mark answer

(e) $y = 8 - 2x$: grad $= -2$

$y = x^2$

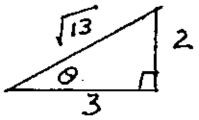
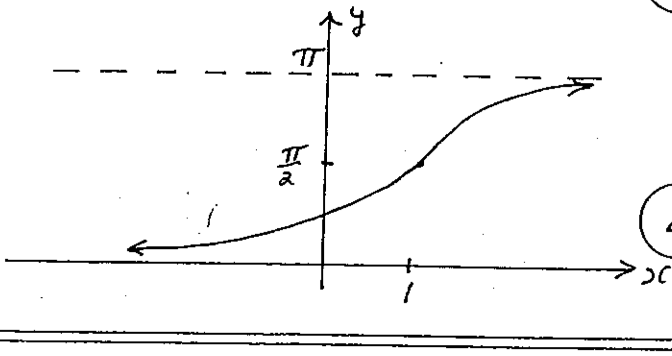
$\frac{dy}{dx} = 2x$. grad $= 4$ at $(2, 4)$.

$$\tan\theta = \left|\frac{m_1 - m_2}{1 + m_1 m_2}\right|$$
$$= \left|\frac{-2 - 4}{1 + (-2)\times 4}\right|$$
$$= \frac{6}{7}$$
$$\theta = 40^\circ 36' \text{ OR } 41^\circ \text{(nearest degree)}$$

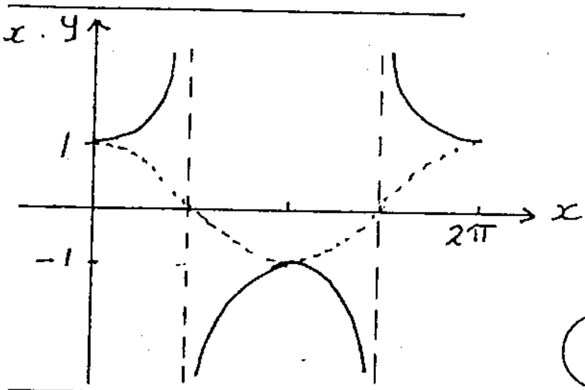
4

Generally well done.
Some used an incorrect formula.
1 Mark correct gradients
2 Marks substitution and simplification in formula
1 Mark answer

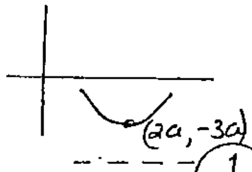
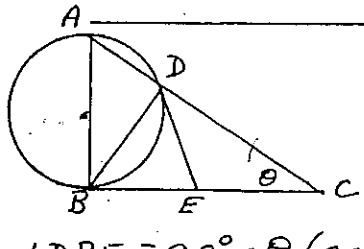
Mathematics Extension 1: Question 2 .

Suggested Solutions	Marks Awarded	Marker's Comments
(a) $\int \frac{x}{\sqrt{16-x^4}}\,dx = \frac{1}{2}\int \frac{2x\,dx}{\sqrt{16-x^4}}$ $u = x^2$, $\frac{du}{dx} = 2x$, $du = 2x\,dx$ $= \frac{1}{2}\int \frac{1}{\sqrt{16-u^2}}\,du$ $= \frac{1}{2}\sin^{-1}\frac{u}{4} + C$ $= \frac{1}{2}\sin^{-1}\frac{x^2}{4} + C$ 3		Well done
(b) $\int_0^{\frac{\pi}{4}} \sin^2 2x\,dx = \int_0^{\frac{\pi}{4}} \frac{1}{2}(1-\cos 4x)\,dx$ $= \frac{1}{2}\left[x - \frac{1}{4}\sin 4x\right]_0^{\frac{\pi}{4}}$ $= \frac{1}{2}\left[\left(\frac{\pi}{4} - \frac{1}{4}\times 0\right) - (0-0)\right]$ $= \frac{\pi}{8}$ 3		Those that started with the result $\sin^2 x = \frac{1}{2}(1-\cos 2x)$ did better than those that went straight into the expression integrated.
(c) $\sin\left(2\tan^{-1}\frac{2}{3}\right)$ Let $\theta = \tan^{-1}\frac{2}{3}$, $\tan\theta = \frac{2}{3}$  $= \sin 2\theta$ $= 2\sin\theta\cos\theta$ $= 2 \times \frac{2}{\sqrt{13}} \times \frac{3}{\sqrt{13}}$ $= \frac{12}{13}$ 3		Well done
(d) $f(x) = \frac{\pi}{2} + \tan^{-1}(x-1)$ (i) $-\frac{\pi}{2} < \tan^{-1}(x-1) < \frac{\pi}{2}$ $\therefore\ 0 < \frac{\pi}{2} + \tan^{-1}(x-1) < \pi$. 1		i) well done
(ii)  2		ii) Some forgot to move the curve across 1 unit $\therefore$ had the y-intercept as $\frac{\pi}{2}$.

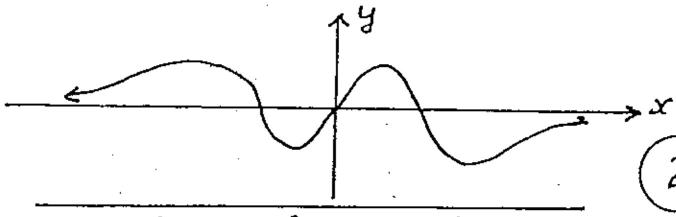
Mathematics Extension 1: Question 3

<table>
<tr><th>Suggested Solutions</th><th>Marks Awarded</th><th>Marker's Comments</th></tr>
<tr><td>(a) $\cos \pi x = \frac{\sqrt{3}}{2}$
$\pi x = 2n\pi \pm \frac{\pi}{6}$
$x = 2n \pm \frac{1}{6}$
(2)</td><td></td><td>a) Poorly answered.
1 mark for each part to answer.</td></tr>
<tr><td>(b) $\sin(A+B) = \sin A \cos B + \cos A \sin B$
$\sin 105° = \sin(60° + 45°)$
$= \sin 60° \cos 45° + \cos 60° \sin 45°$
$= \frac{\sqrt{3}}{2} \times \frac{1}{\sqrt{2}} + \frac{1}{2} \times \frac{1}{\sqrt{2}}$
$= \frac{\sqrt{3}+1}{2\sqrt{2}}$ OR $\frac{\sqrt{6}+\sqrt{2}}{4}$
(2)</td><td></td><td>b) Well answered.
1 Mark for rule ~~& substitut~~ value
1 Mark for simplification</td></tr>
<tr><td>(c) $y = \sec x$

(2)</td><td></td><td>Many sketches were messy.
Some lost mark for not showing asymptotes</td></tr>
<tr><td>(d) (i) $6\sin\theta - 8\cos\theta \equiv R\sin(\theta - \alpha)$
$\equiv R\sin\theta\cos\alpha - R\cos\theta\sin\alpha$
$R\cos\alpha = 6$ $R^2(\cos^2\alpha + \sin^2\alpha) = 6^2 + 8^2$
$R\sin\alpha = 8$ $R^2 = 100$
$\tan\alpha = \frac{8}{6}$ $R = 10$ $(R > 0)$
$\alpha = 53°08'$ (OR $53°$)
$\therefore 6\sin\theta - 8\cos\theta \equiv 10\sin(\theta - 53°08')$
(2)</td><td></td><td>a) Generally well done
1 Mark for R in correct form
1 Mark for correct angle</td></tr>
<tr><td>(ii) $10\sin(\theta - 53°08') = 4$
$\sin(\theta - 53°08') = \frac{4}{10}$
$\theta - 53°08' = 23°35'$ or $156°25'$
$\theta = 76°43'$ or $209°33'$
(2)</td><td></td><td>Poorly answered.
Many couldn't give <u>both</u> answers</td></tr>
<tr><td>(iii) Minimum value of -10 when
$\theta - 53°08' = 270°$
i.e. $\theta = 323°08'$
(2)</td><td></td><td>Poorly answered
a large number couldn't give the min. value and value for θ when this occured.</td></tr>
</table>

Mathematics Extension 1: Question 4

Suggested Solutions	Marks Awarded	Marker's Comments
(a) $8ay = x^2 - 4ax - 20a^2$ (i) $x^2 - 4ax + 4a^2 = 8ay + 20a^2 + 4a^2$ $(x-2a)^2 = 8a(y+3a)$. Vertex is $(2a, -3a)$. (2)		Many students didn't handle the algebra well. or were confused with working with the 'a'.
(ii) $A = 2a$ Directrix: $y = -5a$  (1)		
(b) $x^2 = 8y$ i.e. $y = \frac{x^2}{8}$ (i) $\frac{dy}{dx} = \frac{2x}{8} = \frac{2 \times 4p}{8} = p$ at $(4p, 2p^2)$ Tangent at P: $y - 2p^2 = p(x - 4p)$ $y - 2p^2 = px - 4p^2$ $px - y - 2p^2 = 0$ (2)		i) well done
(ii) Tangent at P: $px - y = 2p^2$ (1) Tangent at Q: $qx - y = 2q^2$ (2) (1)−(2) $(p-q)x = 2p^2 - 2q^2$ $= 2(p-q)(p+q)$ $x = 2(p+q)$ Subst. into (1): $y = p \times 2(p+q) - 2p^2$ $= 2p^2 + 2pq - 2p^2$ $= 2pq$ T is $[2(p+q), 2pq]$ (3)		ii) didn't have to derive tangent at Q. a number of students couldn't solve the simultaneous eqns or didn't see that $2p^2 - 2q^2 = 2(p+q)(p-q)$.
(iii) x-coord of $M = \frac{4p+4q}{2} = 2(p+q)$ Since T, M have the same x-coord., then $TM \parallel y$-axis (axis of parabola) (1)		iii) many students found gradient of TM and showed that it was undefined ∴ TM is a vertical line. Correct but more working than given explanation.
(c)  $\angle ADB = 90°$ (angle in a semi-circle) $\therefore \angle BDC = 90°$ $\therefore \angle DBE = 90° - \theta$ (angle sum of $\triangle BDC$) $\therefore \angle BDE = 90° - \theta$ (base angles of isos. $\triangle BDE$ since $EB = ED$ (tangents from external point are equal)) $\therefore \angle BED = 180° - 2(90° - \theta)$ (angle sum of $\triangle BDE$) $= 2\theta$ (3)		c) well done by those that worked through it.

Mathematics Extension 1: Question 5

Suggested Solutions	Marks Awarded	Marker's Comments
(a)  ②		Generally well done
(b). $P(x) = x^3 + 4x^2 + ax + b$ (i) $P(1) = 0$: $1 + 4 + a + b = 0$ $\therefore a + b = -5$ (1) $P(-2) = 0$: $-8 + 16 - 2a + b = 0$ $\therefore -2a + b = -8$ (2) (1) − (2): $3a = 3$ $\therefore a = 1,\ b = -6$ ②		Well done.
(ii) $(x-1)(x+2)(x+c) \equiv x^3 + 4x^2 + x - 6$ $\therefore -2c = -6$ $\therefore c = 3$ Third factor is $(x+3)$ OR Use "sum of roots" ①		Well done
(c) $P(x) = x^3 - 5x + 3$ (i) $P(1) = -1$; $P(2) = 1$ $P(1.5) = 1.5^3 - 5 \times 1.5 + 3 = -1.125$ $\therefore$ Root lies between 1.5 and 2 ①		For mark needed to show $P(1.5) < 0$ $P(2) > 0$ $\therefore$ lies between 1.5 and 2.
(ii) $x_2 = x_1 - \dfrac{P(x_1)}{P'(x_1)}$ $P'(x) = 3x^2 - 5$ $P'(1.5) = 3 \times 1.5^2 - 5 = 1.75$ $= 1.5 - \dfrac{-1.125}{1.75}$ $= 2.14$ (2dp) ②		Well done
(d) Prove $5^n + 2 \times 11^n$ is a multiple of 3 When $n = 1$, $5^n + 2 \times 11^n = 5 + 2 \times 11 = 27 = 3 \times 9$ $\therefore$ it is true for $n = 1$ Assume it is true for $n = k$. i.e. assume $5^k + 2 \times 11^k = 3M$ (M integer) When $n = k+1$, $5^n + 2 \times 11^n = 5^{k+1} + 2 \times 11^{k+1}$ $= 5 \times 5^k + 2 \times 11 \times 11^k$ $= 5(3M - 2 \times 11^k) + 22 \times 11^k$ by assumption $= 15M - 10 \times 11^k + 22 \times 11^k$ $= 15M + 12 \times 11^k$ $= 3(5M + 4 \times 11^k)$ $\therefore$ if it is true for $n = k$, then it is true for $n = k+1$. Since it is true for $n = 1$, it is true for all positive integers n. ④		Poorly answered. 1 Mark for proving true for n=1 1 Mark for assuming $5^k + 2 \times 11^k = 3M$ and substitution into T_{k+1}. 1 Mark for showing T_{k+1} is a multiple of 3 1 Mark for conclusion. Those that could not prove it true for n=k+1 were only awarded 1 Mark

Mathematics Extension 1: Question 6

Suggested Solutions	Marks Awarded	Marker's Comments
(a) $PV = 3000$ $P = 3000V^{-1}$ $\frac{dP}{dV} = -3000V^{-2} = -\frac{3000}{V^2}$ ✓ $\frac{dP}{dt} = \frac{dP}{dV} \times \frac{dV}{dt}$ ✓ When $V=100$, $\frac{dV}{dt} = 30$ $\frac{dP}{dt} = -\frac{3000}{(100)^2} \times 30$ $= -9$ ✓ Pressure is decreasing at 9 kpa/minute.	3	a) Well done by those that attempted. Disappointing to see that a number of students didn't know where to start.
(b) $\frac{dM}{dt} = -0.01(M-50)$ (i) $M = 50 + Ae^{-0.01t}$ $\frac{dM}{dt} = -0.01Ae^{-0.01t}$ $= -0.01(M-50)$	1	i) well done
(ii) When $t=0$, $M=80$ $\therefore 80 = 50 + Ae^0$ $A = 30$	1	ii) well done
(iii) When $t=60$, $M = 50 + 30 \times e^{-0.01 \times 60}$ Mass of salt = 66.5 kg	1	iii) well done
(iv) Least amount of salt = 50 kg.	1	iv) Needed to know that as $t \to \infty$, $e^{-0.01t} \to 0$.
(c) (i) $x = A \sin nt$ Period $= \frac{2\pi}{n} = 6 \therefore n = \frac{2\pi}{6} = \frac{\pi}{3}$ $\therefore x = 20 \sin \frac{\pi}{3} t$ ✓✓	2	i) Some students incorrectly let $n = 6$ instead of $\frac{2\pi}{n} = 6$.
(ii) $v = 20 \times \frac{\pi}{3} \cos \frac{\pi}{3} t$ Maximum velocity $= \frac{20\pi}{3}$ cm/sec	1	ii) Many students found max. velocity by letting acceleration = 0. Easier & less working to consider amplitude of velocity function.
(iii) $v^2 = n^2(a^2 - x^2)$ $\left(\frac{10\pi}{3}\right)^2 = \left(\frac{\pi}{3}\right)^2 (400 - x^2)$ $100 = 400 - x^2$ $x^2 = 300$ Distance $= 10\sqrt{3}$ cm OR When $v = \frac{10\pi}{3}$, $\frac{10\pi}{3} = \frac{20\pi}{3} \cos \frac{\pi}{3} t$ $\cos \frac{\pi}{3} t = \frac{1}{2} \therefore \frac{\pi}{3} t = \frac{\pi}{3} \therefore t = 1$ When $t=1$, ✓ $x = 20 \sin \frac{\pi}{3}$ $= 20 \times \frac{\sqrt{3}}{2}$ $= 10\sqrt{3}$ ✓	2	iii) Most students used second method. First method produced less errors.

Mathematics Extension 1: Question 7.

Suggested Solutions	Marks Awarded	Marker's Comments
(a) $\left(x - \frac{2}{x^2}\right)^9$ By inspection, term in x^3 is $\binom{9}{2} x^7 \left(-\frac{2}{x^2}\right)^2$ Coefficient of $x^3 = \binom{9}{2}(-2)^2$ $= 144$	2	Well done. Some needed to expand completely as they couldn't find the coefficient by using the general term.
(b) $v = \frac{5}{x}$ for $x > 0$. (i) $a = \frac{d}{dx}\left(\frac{1}{2}v^2\right)$ $= \frac{d}{dx}\left(\frac{1}{2} \times \frac{25}{x^2}\right)$ $= \frac{d}{dx}\left(\frac{25}{2}x^{-2}\right)$ $= -25x^{-3}$ When $x=2$, $a = -\frac{25}{2^3}$ Acceleration $= -3\frac{1}{8}$ m/s^2	3	(b)(i) Generally well done. 1 Mark $\frac{d}{dx}\left(\frac{25}{2}x^{-2}\right)$ 1 Mark Correct differentiation 1 Mark answer.
(ii) $\frac{dx}{dt} = \frac{5}{x}$ $\frac{dt}{dx} = \frac{x}{5}$ $t = \frac{x^2}{10} + c$ When $t=0$, $x=10$: $0 = \frac{100}{10} + c \therefore c = -10$ $t = \frac{x^2}{10} - 10$ $x^2 = 10(t+10)$ $x = \sqrt{10(t+10)}$ $(x>0)$	3	(ii) Poorly answered. Many thought this was a log problem and tried to integrate 1 Mark integrating correctly 1 Mark Finding the constant 1 Mark Making x subject.
(c) $x = Vt\cos\theta$ $y = Vt\sin\theta - \frac{1}{2}gt^2$ (i) $\dot{y} = V\sin\theta - gt$. Max. height when $\dot{y}=0$. $\therefore t = \frac{V\sin\theta}{g}$ Max. ht. $= V\left(\frac{V\sin\theta}{g}\right)\sin\theta - \frac{g}{2}\left(\frac{V\sin\theta}{g}\right)^2$ $= \frac{V^2\sin^2\theta}{g} - \frac{V^2\sin^2\theta}{2g}$ $= \frac{V^2\sin^2\theta}{2g}$	3	(c) Many got 2/3 Marks as they couldn't simplify to achieve the answer. 1 Mark for finding $\dot{y}$ 1 Mark for find time when at max ht. 1 Mark for max ht.
(ii) $\dot{x} = V\cos\theta$ At maximum height, direction is horizontal. $\therefore$ Speed at maximum height is $V\cos\theta$.	1	(ii) Poorly answered. A wide variety of answers.