Q1	MATH LS — FIRST SESSION-2007	Marks
1-a	◇ $1 + 1 + 0 - 2 = 0$; $A \in (P)$ ◇ $2 + 0 + 0 - 2 = 0$; $B \in (P)$ ◇ $1 + 3 - 2 - 2 = 0$; $C \in (P)$ OR $\vec{AM}.(\vec{AB} \wedge \vec{AC}) = 0$; $\begin{vmatrix} x-1 & y-1 & z \\ 1 & -1 & 0 \\ 0 & 2 & -1 \end{vmatrix} = 0$; $x + y + 2z - 2 = 0$	1/2
1-b	$\vec{AE}(1;1;2)$ and $\vec{N_P}(1;1;2)$; (AE) is perpendicular to plane (P).	1/2
1-c	$S = \frac{1}{2} \lVert \vec{AB} \wedge \vec{AC} \rVert = \frac{\sqrt{1+1+4}}{2} = \frac{\sqrt{6}}{2}$. $V = \frac{1}{3} S \times AE = \frac{1}{3} \times \frac{\sqrt{6}}{2} \times \sqrt{6} = 1$ OR : $V = \frac{1}{6} \lvert \vec{AE}.(\vec{AB} \wedge \vec{AC}) \rvert = \frac{1}{6} \lvert 1+1+4 \rvert = 1$	1
2-a	$\vec{IM}.(\vec{AE} \wedge \vec{BC}) = 0$ where $I(\frac{3}{2};\frac{1}{2};0)$; So $\begin{vmatrix} x-\frac{3}{2} & y-\frac{1}{2} & z \\ 1 & 1 & 2 \\ -1 & 3 & -1 \end{vmatrix} = 0$ (Q) : $7x + y - 4z - 11 = 0$.	1
2-b	$\vec{N_P}.\vec{N_Q} = -7 - 1 + 8 = 0$; (P) and (Q) are perpendicular.	1/2

2-c	(BC) // (Q) and (BC) is a line in (P) , so (BC) is parallel to the line of intersection of (P) and (Q).
	OR : $(d) = (P) \cap (Q)$: $\begin{cases} x + y + 2z - 2 = 0 \\ 7x + y - 4z - 11 = 0 \end{cases}$; $(d) : \begin{cases} x = t + \frac{3}{2} \\ y = -3t + \frac{1}{2} \\ z = t \end{cases}$
	$\vec{BC}(-1 ; 3 ; -1)$ and $\vec{V_d}(1 ; -3 ; 1)$.
	So (BC) //(d).
		1/2

Q2	MATH LS — FIRST SESSION-2007	Marks
1-a	$P(W/T) = \frac{3}{13}$; $P(W/A) = \frac{5}{7}$; $P(W\cap T) = \frac{3}{20}$; $P(W) = \frac{8}{20}$	1
1-b	$P(T/M) = \frac{10}{12} = \frac{5}{6}$	1/2
2-a	$P(X = 1) = \frac{3\times 10}{C_{13}^{2}} \times \frac{2}{7} + \frac{C_{10}^{2}}{C_{13}^{2}} \times \frac{5}{7} = \frac{285}{546} = \frac{95}{182}$	1
2-b	$P(X= 0) = \frac{C_{10}^{2}}{C_{13}^{2}} \times \frac{2}{7} = \frac{90}{546} = \frac{15}{91}$ $P(X= 2) = \frac{C_{3}^{2}}{C_{13}^{2}} \times \frac{2}{7} + \frac{3\times 10}{C_{13}^{2}} \times \frac{5}{7} = \frac{156}{546} = \frac{26}{91}$ $P(X= 3) = \frac{C_{3}^{2}}{C_{13}^{2}} \times \frac{5}{7} = \frac{15}{546} = \frac{5}{182}$	1 1/2

Table for 2-a (X = 1):

	T		A	
	3W	10M	5W	2M
	1	1	0	1
Or	0	2	1	0

Table for X = 0:

T		A	
3W	10M	5W	2M
0	2	0	1

Table for X = 2:

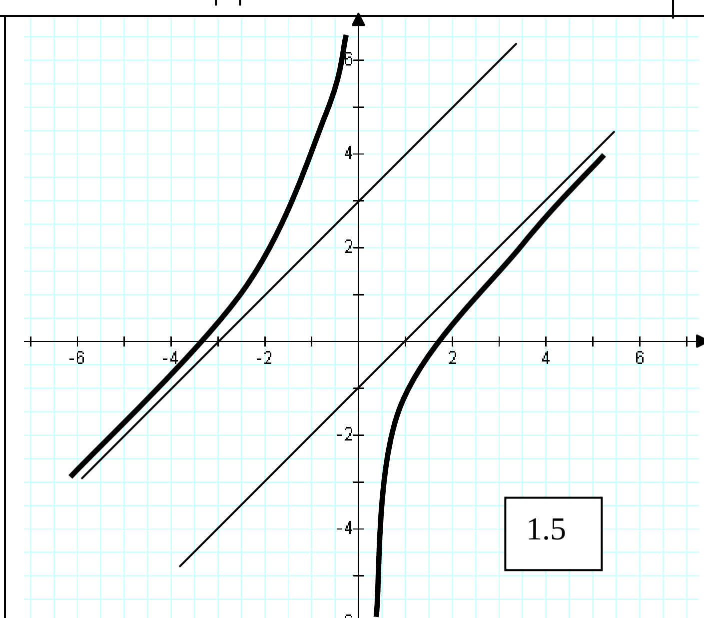
	T		A	
	3W	10M	5W	2M
	2	0	0	1
Or	1	1	1	0

Table for X = 3:

T		A	
3W	10M	5W	2M
2	0	1	0

x_i	0	1	2	3
P_i	$\frac{15}{91}$	$\frac{95}{182}$	$\frac{26}{91}$	$\frac{5}{182}$

Q3	MATH LS FIRST SESSION-2007	Marks
1-a	$\|z-2i\|=\sqrt{2}$ is equivalent to EM= $\sqrt{2}$ Thus (T) is the circle of center E and radius $\sqrt{2}$.	1
1-b	EG= $\|z_G - z_E\| = \|-1-i\| = \sqrt{2}$,thus G $\in$ (T).	1/2
2-a	$\left\|\frac{z-2i}{z+2i}\right\| = 1$ is equivalent to $\|z-2i\| = \|z+2i\|$ so ME=MF and (L) is the perpendicular bisector of [EF], which is the axis of abscissas.	1/2
2-b	W $\in$ (L) so $\|z_0 - 2i\| = \|z_0 + 2i\| = 3$; Let $z_0 = x + iy$. $\|x+iy-2i\| = \|x+iy+2i\|$ is equivalent to $x^2 + (y-2)^2 = x^2 + (y+2)^2$ y = 0 gives $x^2 + 4 = 9$; $x = \sqrt{5}$ or x= $-\sqrt{5}$, consequently $z_0 = \sqrt{5}$ or $z_0 = -\sqrt{5}$ OR : $W \in x'x$ and EW=3 so $OW^2 = EW^2 - OE^2 = 9 - 4 = 5$; OW= $\sqrt{5}$ thus $z_0 = \sqrt{5}$ or $z_0 = -\sqrt{5}$.	1/2
3-a	$z_A = -1 - i = \sqrt{2}e^{5\frac{\pi}{4}i}$, $z_B = 2 + 2i = 2\sqrt{2}e^{\frac{\pi}{4}i}$.	1
3-b	$\arg z_A = 5\frac{\pi}{4}$, $\arg z_B = \frac{\pi}{4}$; $\arg z_A = \arg z_B + \pi$ so O, A and B are collinear OR : $z_B = -2z_A$ or $\overrightarrow{OB} = -2\overrightarrow{OA}$.	1/2

Q4	MATH LS FIRST SESSION-2007	Marks
1-a	$\lim\limits_{\substack{x\to 0\\ x>0}} f(x) = -1-\dfrac{4}{0^+} = -\infty$; $\lim\limits_{\substack{x\to 0\\ x<0}} f(x) = -1-\dfrac{4}{0^-} = +\infty$ So the axis of ordinates of equation $x = 0$ is an asymptote of (C) .	1/2
1-b	$\lim\limits_{x\to+\infty} f(x) = +\infty - 0 = +\infty$; $\lim\limits_{x\to+\infty} [f(x)-(x-1)] = \lim\limits_{x\to+\infty} \dfrac{4}{e^x-1} = 0$	1
1-c	$\lim\limits_{x\to-\infty} [f(x)-(x+3)] = \lim\limits_{x\to-\infty} (x-1-\dfrac{4}{e^x-1}-x-3) = \lim\limits_{x\to-\infty} (-4-\dfrac{4}{e^x-1})$ $= -4+4 = 0.$	1/2
2	The domain of f is centered at O.. $f(-x)+f(x) = -x-1-\dfrac{4}{e^{-x}-1}+x-1-\dfrac{4}{e^x-1} = -2+\dfrac{4e^x}{e^x-1}+\dfrac{4}{e^x-1}$ $= -2+4 = 2$, thus S(0 ; 1) is a center symmetry of (C).	1/2
3-a	$f'(x) = 1+\dfrac{4e^x}{(e^x-1)^2} > 0.$ x: $-\infty$ … 0 … $+\infty$ f '(x): + ‖ + f (x): $-\infty$ ↗ $+\infty$ ‖ $-\infty$ ↗ $+\infty$	1
3-b	f is continuous and strictly increasing from $-\infty$ to $+\infty$ on $]-\infty ; 0[$;the equation f(x) = 0 has over this interval a unique negative root β ; $f(-3.2) = -0.03 < 0$ and $f(-3.1) = 0.088 > 0$ so $-3.2 < \beta < -3.1$. Similarly : f(x) = 0 has over $]0 ; +\infty[$ a unique positive root α ; $f(1.7) = -0.154 < 0$ and $f(1.8) = +0.0078 > 0$ so $1.7 < \alpha < 1.8$. 1 point 	2.5
5-a	$x+3-\dfrac{4e^x}{e^x-1} = x-1+4-\dfrac{4e^x}{e^x-1} = x-1+\dfrac{4e^x-4-4e^x}{e^x-1} = x-1-\dfrac{4}{e^x-1}$.	1/2
5-b	$A = \displaystyle\int_2^3 (x+3-\dfrac{4e^x}{e^x-1})\,dx = \left[\dfrac{x^2}{2}+3x-4\ln(e^x-1)\right]_2^3 = \dfrac{11}{2}+4\ln\left(\dfrac{e^2-1}{e^3-1}\right) = 1.122\ u^2$	1
6	f(x) = g(x) equivalent to f(x) = x ; $x-1-\dfrac{4}{e^x-1} = x$; $-1 = \dfrac{4}{e^x-1}$; $e^x = -3$ is impossible since ($e^x > 0$) .So the equation f(x) = g(x) has no roots.	1/2