MEGA LECTURE

Q1.

10 (i)	$2(x-1)^2-1$ *OR* $a=2, b=-1, c=-1$ $A=(1,-1)$	B1, B1, B1 B1√ [4]	Allow alt. method for final mark
(ii)	$2x^2-5x-3=0 \Rightarrow (2x+1)(x-3)=0$ **OE** in y $x=-½,\ y=3½$	M1, M1 A1 [3]	Complete elim & simplify, attempt soln. Additional (3, 7) not penalised
(iii)	Mid-point of $AP=(2,3)$	B1√	Follow through on *their A*
	Gradient of line $= \dfrac{\frac{1}{2}}{\frac{-5}{2}} - \dfrac{-1}{5}$	B1	
	Equation is $y-3=\dfrac{-1}{5}(x-2)$ **OE**	B1 [3]	Or $y-3½=-\dfrac{1}{5(x+\frac{1}{2})}$

Q2.

2	$y=mx+4$ $\qquad y=3x^2-4x+7$ Equate $\rightarrow 3x^2-(4+m)x+3=0$ Uses $b^2-4ac \rightarrow (4+m)^2-36$ Solution of quadratic $m=2$ or -10 Set of values $m>2$ or $m<-10$	M1 M1 DM1 A1 A1 [5]	Eliminates y (or x) completely Any use of b^2-4ac Method shown. Correct end-values co

Q3.

5 (i)	$6x+2-7\sqrt{x} \Rightarrow 6(\sqrt{x})^2-7\sqrt{x}+2=0$	M1	Expressing as a clear quadratic soi
	$(3\sqrt{x}-2)(2\sqrt{x}-1)=0$	M1	oe e.g. $(3t-2)(2t-1)=0$
	$\sqrt{x}=\dfrac{2}{3}$ or $\dfrac{1}{2}$	A1	1 solution sufficient. Accept e.g. $t=2/3$
	$x=\dfrac{4}{9}$ or $\dfrac{1}{4}$ (or 0.444, 0.25)	A1	Both solutions required cao
	OR $(6x+2)^2-49x \rightarrow 36x^2-25x+4=0$	M1A1	Attempt to square both sides
	$(9x-4)(4x-1)=0$	M1	Attempt to solve (or formula etc.)
	$x=\dfrac{4}{9}$ or $\dfrac{1}{4}$ (or 0.444, 0.25) oe	A1 [4]	
(ii)	$7^2-4\times 6\times k(=0)$	M1	Apply $b^2-4ac(=0)$
	$k=\dfrac{49}{24}$ or 2.04	A1	Attempt to equate derivatives
	OR $\dfrac{d}{dx}(7x^{\frac{1}{2}})-\dfrac{d}{dx}(6x+k) \rightarrow \dfrac{7}{2}x^{-\frac{1}{2}}-6$	M1	
	$x=\dfrac{49}{144}$, $y=\dfrac{49}{12} \rightarrow k=\dfrac{49}{24}$ or 2.04	A1 [2]	

Q4.

MEGA LECTURE

10 $2y+x-k \quad xy-6$ **(i)** $2y+x-8 \rightarrow y(8-2y)-6$ $2y^2-8y+6-0$ or $x^2-8x+12=0$ $\rightarrow (6, 1)$ and $(2, 3)$ Midpoint $M(4, 2)$ $m=-½$ Perpendicular $m=2$ $\rightarrow y-2-2(x-4)$ **(ii)** $(k-2y)y-6$ $\rightarrow 2y^2-ky+6-0$ or $x^2-kx+12=0$ Uses b^2-4ac (0) $\rightarrow k^2>48$ $\rightarrow k<-\sqrt{48}$ and $k>\sqrt{48}$	M1 DM1A1 M1 M1 A1 [6] M1 A1 A1 [3]	Complete elimination of x (or y) DM1 soln of quadratic. co for their 2 points Uses $m_1m_2=-1$ to find perp. gradient co unsimplified Any use of b^2-4ac on a quadratic = 0 For $\sqrt{48}$ on its own All correct.

Q5.

7 (i) $x^2-4x+4-x \Rightarrow x^2-5x+4-0$ $(x-1)(x-4)(-0)$ or other valid method (1, 1), (4, 4) Mid-point = (2½, 2½) **(ii)** $x^2-(4+m)x+4-0 \rightarrow (4+m)^2-4(4)-0$ $4+m-\pm 4$ or $m(8+m)-0$ $m-8$ $x^2+4x+4-0$ $x=-2,\ y=16$ **Alt (ii)** $2x-4=m$ $x^2-4x+4=(2x-4)x$ $x=-2$ (ignore +2) $m=-8$ (ignore 0) $y=16$	**M1** **M1** **A1** **A1** √ **[4]** **M1** **DM1** **A1** **M1** **A1** **[5]** **M1** **DM1** **A1** **A1** **A1**	Eliminate y to reach 3-term quadratic Attempt solution ft dependent on 1st M1 Applying $b^2-4ac=0$ Attempt solution Ignore $m=0$ in addition Sub non-zero m and attempt to solve Ignore (2, 0) solution from $m=0$ **OR** $2x-4=m$ Sub $x=\frac{m+4}{2}$, $y=\frac{m(m+4)}{2}$ into quad $m=-8$ from resulting quad $m(m+8)=0$ $x=-2$ $y=16$

Q6.

2	$\frac{\delta y}{\delta x}=9x^2-12x+4$ $(3x-2)^2\geq 0$	M1A1 A1	[3]	

Q7.

9	(i) $x^2+3x+4=2x+6 \Rightarrow x^2+x-2(=0)$	M1		3-term simplification
	$(x-1)(x+2)-0 \rightarrow (1,8),(-2,2)$	DM1A1		DM1 for attempted solution for x
	$AB-\sqrt{3^2+6^2}-6.71$ or $\sqrt{45}$ or $3\sqrt{5}$	B1		cao ($\sqrt{45}$ from wrong points scores B0)
	$\left(-\frac{1}{2},5\right)$	B1√	[5]	Ft *their* coordinates

	(ii) $x^2+(3-k)x+2k-6(=0)$	M1		Simplified to 3-term quadratic
	$(3-k)^2-4(2k-6)=0$	DM1		Apply $b^2-4ac=0$ as function of k only
	$(3-k)(11-k)-0$	DM1		Attempt factorisation or use formula Both correct
	$k=3$ or 11	A1	[4]	NB Alternative methods for **(ii)** possible

Q8.

3	(i) $2x^5+3x^2=2x \Rightarrow 2x^5+3x^2-2x=0$ $[x(2x]^4+3x^2-2)=0$ $2x^4+3x^2-2=0$	M1 A1	[2]	first line essential **AG** Factorising needed for A1
	(ii) $(x^2+2)(2x^2-1)=0$	M1		Reasonable attempt at solving a quadratic in x^2
	$x=\pm 1/\sqrt{2}$ only $\left(1/\sqrt{2}, 2/\sqrt{2}\right),\left(-1/\sqrt{2}, -2/\sqrt{2}\right)$	A1 A1	[3]	For a correct pair of solutions, either 2 x's or 1 x and 1 y SC (±0.707, ±1.41) AWRT B1

Q9.

7	(i) $y = m(x-2)$ oe	B1 [1]	Accept $y = mx + c$, $c = -2m$
	(ii) $x^2 - 4x + 5 = mx - 2m \Rightarrow x^2 - x(4+m) + 5 + 2m = 0$ $(4+m)^2 - 4(5+2m) = 0 \Rightarrow m^2 - 4 = 0$ $m = \pm 2$ $m = 2 \Rightarrow x^2 - 6x + 9 = 0 \Rightarrow x = 3$ $m = -2 \Rightarrow x^2 - 2x + 1 = 0 \Rightarrow x = 1$ (3, 2), (1, 2)	M1 DM1 A1 DM1 A1 A1 [6]	Apply $b^2 - 4ac$ Substitute their m and attempt to solve for x Allow for a pair of x values or 1 x and 1 y.
	OR $m=2^x-4$ $y=m^x-2m$, $y= x2 - 4x + 5$	M1 M1 M1 A1 A1 A1	**Eliminating 2 variables from 3 equations.** **Obtaining a quadratic in x or y.** **Solving their quadratic correctly.** A pair of x values or 1 x and 1 y.. m=2,–2 also needed for final mark.
	(iii) $(x-2)^2 + 1$, (2, 1)	B1,B1 [2]	

Q10.

10	(i)	B1 [1]	AG
	(ii) $(6 + k)^2 - (4)(2)(2 + 3k) = 0$ $k = 2$ or 10	M1 A1 A1 [3]	Apply $b^2 - 4ac$ cao
	(iii) or (2,–2) $k = 10 \Rightarrow 2(x-4)^2 = 0$ $x = 4$, $y = 2$ or (4, 2) *AB*:	M1 A1 M1 A1 M1 A1 [6]	 $(y = 2x - 6)$

Q11.

1	$(x+1)(x-2)$ or other valid method $-1, 2$ $x < -1, x > 2$	M1 A1 A1 [3]	Attempt soln of eqn or other method Penalise $<, >$