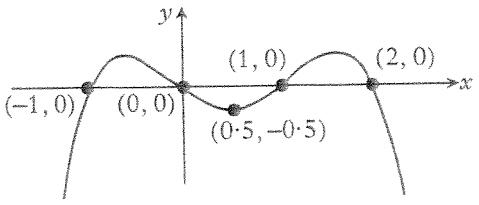
Higher Maths – End of Course Assessment 2009/2010 (Answers + Marking Scheme)
Paper 2

	Give 1 mark for each •	Illustration(s) for awarding each mark
1 (a)	**ans:** $k = 10$ **(3 marks)**	
	•1 finds change in x – coords/y – coords	•1 CB – 6 to 6 = 12; CP – 6 to – 3 = 3 [x] CB 1 to – 3 = 4; CP 1 to 0 = 1
	•2 realises $\overrightarrow{CP} = \frac{1}{4}\overrightarrow{CB}$	•2 evidence
	•3 establishes z – coordinate of P	•3 12 – 4 = 8 so change in z – coord is 2; $k = 10$
(b)	**ans:** $139{\cdot}5^{\circ}$ **(5 marks)**	
	•1 know how to find angles	•1 evidence of $\cos\theta = \dfrac{\boldsymbol{a}\,.\,\boldsymbol{b}}{\lvert\boldsymbol{a}\rvert\lvert\boldsymbol{b}\rvert}$
	•2 finds $\overrightarrow{PA}$ and $\overrightarrow{PB}$	•2 $\overrightarrow{PA} = \begin{pmatrix}-1\\0\\3\end{pmatrix}$; $\overrightarrow{PB} = \begin{pmatrix}9\\-3\\-6\end{pmatrix}$
	•3 finds scalar product	•3 $\overrightarrow{PA}\,.\,\overrightarrow{PB} = -9 + 0 - 18 = -27$
	•4 finds magnitudes of vectors	•4 $\lvert\overrightarrow{PA}\rvert = \sqrt{10}$; $\lvert\overrightarrow{PB}\rvert = \sqrt{126}$
	•5 substitutes in formula and finds angle	•5 $\cos\theta = \dfrac{-27}{\sqrt{10}\sqrt{126}}$; $\theta = 139{\cdot}5^{\circ}$
2	**ans:** **17 hours 50 minutes** **(5 marks)**	
	•1 substitutes values in formula and simplifies	•1 $28 = 40e^{-0{\cdot}02t}$; $e^{-0{\cdot}02t} = 0{\cdot}7$
	•2 takes natural logs of both sides	•2 $\log_e e^{-0{\cdot}02t} = \log_e 0{\cdot}7$
	•3 releases power and removes $\log_e e$	•3 $-0{\cdot}02t\log_e e = \log_e 0{\cdot}7$; $0{\cdot}02t = \log_e 0{\cdot}7$
	•4 evaluates for t	•4 $t = \dfrac{\log_e 0{\cdot}7}{-0{\cdot}02} = 17{\cdot}8337....$
	•5 changes hours to hours and minutes	•5 17 hours 50 minutes
3(a)	**ans proof** **(1 mark)**	
	•1 proves they are equal	•1 f(-2) = 5 = g(-2)
(b)	**ans (-2,5), (-1,0), (1,2)** **(4marks)**	
	•1 form equation	•1 $x^3 + 2x^2 - x - 2 = 0$
	•2 uses known root to synthetically divide	•2 $\begin{array}{r\|rrrr} -2 & 1 & 2 & -1 & -2 \\ & & -2 & 0 & 2 \\ \hline & 1 & 0 & -1 & 0 \end{array}$
	•3 solves for x	•3 x = -2,-1,1
	•4 determines points of intersection	•4 (-2,5), (-1,0) and (1,2)

(c)	**ans** $2\frac{2}{3}$ **units**^{2} **(4marks)** •[1] sets up correct integral •[2] integrates correctly •[3] substitutes limits in correctly •[4] evaluates correctly	•[1] $\int_{-1}^{1}(2x^2+x-1)-(x^3+4x^2-3)dx$ •[2] $[-\frac{x^4}{4}-\frac{2x^3}{3}+\frac{x^2}{2}+2x]_{-1}^{1}$ •[3] •[4] $2\frac{2}{3}$
4 ans:	$y=\frac{1}{6}(4x+1)^{\frac{3}{2}}+5$ **(5 marks)** •[1] knows to integrate and prepares •[2] starts to integrate •[3] completes integration and adds C •[4] knows to substitute to find C •[5] evaluates for C	•[1] $y=\int(4x+1)^{\frac{1}{2}}dx$ •[2] $y=\frac{(4x+1)^{\frac{3}{2}}}{\frac{3}{2}}$..... •[3] .....$\times\frac{1}{4}+C$; $y=\frac{1}{6}(4x+1)^{\frac{3}{2}}+C$ •[4] $9\cdot5=\frac{1}{6}(4(2)+1)^{\frac{3}{2}}+C$; •[5] $C=9\cdot5-\frac{27}{6}=5$
5(a)	**ans** **(2 marks) (1 mark)** (i) (-1,4) (0,4) (0.5, 5) (1,4) (2,4) (ii) (-0.5, 2) (0,2) (0.25,2.5) (0.5,2) (1,2) •[1] double all y - coords •[2] all points correct •[1] halved all x-coords	
(b)	**ans - Graph**  	•[1] reflected in x-axis •[2] vertical shift •[3] annotation

6(a) **ans:** $y = \sqrt{52}\sin(x - 4.125)°$ **(4 marks)**

•[1] uses correct expansion	•[1] $k\sin x\cos a - k\cos x\sin a$
•[2] equates coefficients	•[2] $k\cos a = -4, k\sin a = -6$
•[3] calculates value of k	•[3] $k = \sqrt{52}$
•[4] finds value for a	•[4] $a = 4.125$

(b) **ans:** **proof** **(2 marks)**

•[1] marshalls facts	•[1] AE = 6cos x, BC = 4sinx, CE = BC CE = AE - 4
•[2] completes proof	•[2] 6cosx – 4 = 4sin x $6\cos x - 4\sin x = 4$

(c) **ans:** **0.396, 4.713** **(3 marks)**

•[1] method	•[1] $\sqrt{52}\sin(x - 4.125)° = 4$
•[2] finds related angle	•[2] 0.588
•[3] solves in range	•[3] $x = 0.396,\ 4.713$

(d) **ans 0.396** **(1 nark)**

•[1] chooses the one $< \frac{\pi}{2}$	•[1] 0.396

Total: 43 marks

Total for both papers – 80 marks