

Higher Grade Unit Tests

Marking Scheme - UNIT 3

	Give 1 mark for each •	Illustration(s) for awarding each mark
1	C	Award 2 marks for each correct answer 10 marks
2	B	
3	C	
4	A	
5	D	
6(a)	ans: proof (3 marks) —¹ finds $\vec{AB}$ —² finds $\vec{BC}$ —³ statement re collinearity	—¹ $\vec{AB} = \begin{pmatrix} -1 \\ 2 \\ 1 \end{pmatrix}$ —² $\vec{BC} = \begin{pmatrix} -2 \\ 4 \\ 2 \end{pmatrix}$ —³ $\vec{BC} = 2\vec{AB}$, so BC is parallel to AB with B a common point
(b)	ans: 1 : 2 (1 mark) —¹ answer	—¹ 1 : 2
7	ans: $\frac{3(2x+1)^{\frac{2}{3}}}{4} + C$ (3 marks) —¹ prepares to integrate —² integrates correctly —³ adds constant of integration	—¹ $(2x+1)^{-\frac{1}{3}} dx$ —² $\frac{3(2x+1)^{\frac{2}{3}}}{4}$ [or equivalent] —³ + C

	Give 1 mark for each •	Illustration(s) for awarding each mark
8(a)	ans: $3\sin(2x - 228)^\circ$ (4 marks) — ¹ finds value of k — ² finds ratio for $\tan \alpha$ — ³ correct quadrant — ⁴ answer	— ¹ $k^2 = -2^2 + (-\sqrt{5})^2; k = 3$ — ² $\tan \alpha = \frac{-\sqrt{5}}{-2}$ — ³ quadrant III — ⁴ 228°
	(b) ans: 213.75° or 284.25° (4 marks) — ¹ realises to use above answer — ² rearranges — ³ finds angle sizes for $(2x - 228)^\circ$ — ⁴ finds x within given limits	— ¹ $3 + 3\sin(2x - 228)^\circ = 2$ — ² $\sin(2x - 228)^\circ = -\frac{1}{3}$ — ³ $2x - 228 = 199.5^\circ$ or 340.5° — ⁴ $x = 213.75^\circ$ or 284.25°
9	ans: 30.5° (5 marks) — ¹ finds $\vec{ML}$ and $\vec{MN}$ — ² finds magnitudes — ³ finds scalar product — ⁴ substitutes into formula — ⁵ finds angle	— ¹ $\vec{ML} = \begin{pmatrix} -2 \\ 6 \\ -9 \end{pmatrix}; \vec{MN} = \begin{pmatrix} -9 \\ 13 \\ -8 \end{pmatrix}$ — ² $ \vec{ML} = 11; \vec{MN} = \sqrt{314}$ — ³ $\vec{ML} \cdot \vec{MN} = 18 + 78 + 72 = 168$ — ⁴ $\cos \theta = \frac{168}{11\sqrt{314}}$ — ⁵ $\theta = 30.5^\circ$
10	ans: $m = 6$ (4 marks) — ¹ knows to take derivative — ² finds derivative — ³ substitutes — ⁴ evaluates to answer	— ¹ $\frac{dy}{dx} = \dots\dots$ — ² $= -6\sin 3x - 2\sin x \cos x$ — ³ $6\sin(\frac{3\pi}{2}) - 2\sin \frac{\pi}{2} \cos \frac{\pi}{2}$ — ⁴ $6 - 0 = 6$
11(a)	ans: proof (4 marks) — ¹ substitutes value for m_t and uses $\frac{1}{2} = 2^{-1}$ — ² takes $\log_e$ of both sides — ³ simplifies — ⁴ realises $0.004 = \frac{1}{250}$ and rearranges to ans	— ¹ $\frac{1}{2} = e^{-0.004t}; 2^{-1} = e^{-0.004t}$ — ² $-\log_e 2 = \log_e e^{-0.004t}$ — ³ $-\log_e 2 = -0.004t$ — ⁴ $\log_e 2 = \frac{1}{250}t; \rightarrow 250\log_e 2 = t$
	(b) ans: $67.7g$ (2 marks) — ¹ substitutes values — ² evaluates to answer	— ¹ $500 \times e^{-0.004 \times 500}$ — ² $67.7g$

Total: 40 marks