

Question			Answer	Marks	AO	Guidance	
3	(a)		M1	1.1	V-shape with the cusp on the positive x-axis – need not be symmetrical – this mark can be awarded if V-shape appears in the first quadrant only (so stops at y-axis)	M0 if V-shape appears in third or fourth quadrants but condone if RH branch appears in third and fourth quadrants (BOD that this is a continuation of the line with equation $y = 2x - 5$)	
			A1	1.1	Fully correct (so appearing in first and second quadrants) with x-intercept labelled as $\frac{5}{2}$ and y-intercept labelled as 5 – need not be symmetrical– condone if appearing in third and fourth quadrants only as a dashed line . Ignore horizontal line if drawn at $y = 1$ (assume working for part (b))	Condone (5,0) labelled on the y-axis, and $\left(0, \frac{5}{2}\right)$ labelled on the x-axis	
			[2]				

Question			Answer	Marks	AO	Guidance	
3	(b)		$ 2x-5 < 1 \Rightarrow -1 < 2x-5 < 1$ $4 < 2x < 6$	M1	1.1	Re-write as $-1 < 2x-5 < 1$ followed by $a < 2x < b$ with either a or b correct or $c < x - \frac{5}{2} < d$ with either c or d correct or for either $x > 2$ or $x < 3$ (so dealing with one inequality correctly) or for both critical values (so 2 and 3 www)	$a = 4, b = 6$ $c = -\frac{1}{2}, d = \frac{1}{2}$ M1 for $ 2x-5 < 1$ $\Rightarrow (2x-4)(2x-6) < 0$
			$2 < x < 3$	A1	1.1	cao – allow as two separate inequalities and allow e.g. ‘ $x > 2$ or $x < 3$ ’. ‘ $x > 2, x < 3$ ’, ‘ $x > 2$ and $x < 3$ ’ etc.	Ignore incorrect set notation provided the intention of the correct inequalities is clear
				[2]			

Question		Answer	Marks	AO	Guidance	
3	(c)	DR $2 < e^{0.1N} < 3$	M1*	3.1a	Use their answer to part (b) to re-write in terms of $e^{0.1N}$. Must imply either $e^{0.1N} > k_1$ and $e^{0.1N} < k_2$ where $k_1 < k_2$ with both positive or $e^{0.1N} = k_1$ and $e^{0.1N} = k_2$ where $k_1 \neq k_2$ with both positive Allow n, x etc. for N throughout	k_1 and k_2 are their critical values from part (b) M0 for $e^{0.1N} > k_2$ and $e^{0.1N} < k_1$ where $k_1 < k_2$
		$10\ln 2 < N < 10\ln 3$	M1dep*	1.1	Correctly take logs of both sides and make N the subject of both inequalities/equations e.g. $\frac{\ln 2}{0.1} < N < \frac{\ln 3}{0.1}$, $10 \times 0.693.. < N < 10 \times 1.098...$ (at least to 1 dp), $N = 10\ln 2$ and $N = 10\ln 3$	Must be correct inequalities/equations for N following through their values of k_1 and k_2 If M0 M0 then SC B1 for 6.93... and 10.98... or $10\ln 2$ and $10\ln 3$
		$6.9(314...) < N < 10.9(861...)$ so $N = 7, 8, 9$ and 10	A1	3.2a	cao www – must see at least $6.9... < N < 10.9...$ followed by all four integer values (and no others) stated explicitly or correct four integer values stated from correct critical values of 6.9... and 10.9... A0 for $7 < N < 10$ oe e.g. $7 - 10$	See Appendix for those using T and I
			[3]			

Trial and Improvement in 3(c) – if only the first M mark awarded by main scheme, then for **B2** (so for possibly full marks) allow one of the two following cases (the working below is the minimum required)

Case 1:

$$e^{0.1N} < 3 \Rightarrow N < 10.98... \text{ and } e^{0.1N} > 2$$

When $N = 7, e^{0.1 \times 7} = 2.0137... > 2$ and when $N = 6, e^{0.1 \times 6} = 1.822 < 2$ therefore $N = 7, 8, 9$ and 10

Case 2:

$$e^{0.1N} < 3, e^{0.1N} > 2 \Rightarrow N > 6.93...$$

When $N = 10, e^{0.1 \times 10} = 2.7182... < 3$ and when $N = 11, e^{0.1 \times 11} = 3.0041... > 3$ therefore $N = 7, 8, 9$ and 10