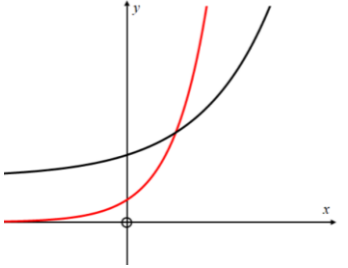


Question		Answer	Marks	AO	Guidance
9	(a)	Stretch in the x -direction	B1	1.2	
		Stretch scale factor $\frac{1}{2}$	B1	1.1b	
			[2]		
9	(b)		B1	1.1b	General shape of exponential graph less steep than the given graph for positive x (note red graph is printed)
			B1	1.1b	Horizontal asymptote above the x -axis and intersection with y -axis must be above that for the given graph
			[2]		
9	(c)	The graphs intersect when $e^{2x} = k + e^x$	M1	2.1	Attempts to solve simultaneously. Allow $k = -\frac{1}{4}$ substituted
		So when $e^{2x} - e^x - k = 0$			
		discriminant $(-1)^2 - 4(-k)$	M1	2.1	Uses discriminant of the equation
		is negative for $k < -\frac{1}{4}$ so no real roots	E1	2.1	must state no real roots or no points of intersection
		and no points of intersection			
			[3]		
9	(d)	When $k = 2$, $e^{2x} - e^x - 2 = 0$	M1	2.1	Evaluates e^x from their quadratic and attempts to use natural logs
		gives $e^x = -1, 2$			
		So $x = \ln 2$ as $e^x = -1$ is not possible	A1	2.1	must state that $\ln 2$ is a root and that there are no others.
					Allow SC1 for substituting $x = \ln 2$ in both equations and concluding it must be a root

Question	Answer	Marks	AO	Guidance		
				[2]		