Question Number	Answer	Mark	Additional Guidance
1a	Use of $a = v\frac{\mathrm{d}v}{\mathrm{d}x}$ or $a = \frac{\mathrm{d}}{\mathrm{d}x}\left(\frac{1}{2}v^2\right)$	M1	Use correct substituted form for a using given function (not just stating $a = v\frac{\mathrm{d}v}{\mathrm{d}x}$ oe).
	$a = \frac{qx}{\left(x^2+4\right)^3}$ condone $a = \frac{p}{\left(x^2+4\right)^3}$	M1	Power going down by 1 but condone error in chain rule if x is lost from numerator. M0 for just differentiating v wrt x.
	$a = \frac{-72x}{\left(x^2+4\right)^3}$	A1	Or equivalent unsimplified. Allow for evaluation of correct expressions of v and $\frac{\mathrm{d}v}{\mathrm{d}x}$ and attempt to multiply.
	Deceleration $= \frac{216}{2197} = 0.098...\left(\mathrm{m\,s^{-2}}\right)$	A1	2 sf or better. Must be positive.
		(4)	
1b	$\frac{\mathrm{d}x}{\mathrm{d}t} = \frac{6}{x^2+4}$	M1	Form differential equation in x and t using given v
	$\int x^2+4\,\mathrm{d}x = \int 6\,\mathrm{d}t$	M1	Separate variables to get polynomials and attempt to integrate (at least one power increasing). 6 could be on either side
	$\frac{1}{3}x^3 + 4x = 6t\,(+C)$	A1	Or equivalent. Condone missing constant of integration
	Use $x = 3, t = 0$ $(\Rightarrow C = 21)$	DM1	Correct use of limits to find constant of integration and use of $x = 6$ to find T (or as limits in a definite integral) E.g. $c = \frac{7}{2}$ with 6 on other side Dependent on both previous M marks.
	$T = 12.5$	A1	Accept $t = 13$
		(5)	
		(9)	