Note: if they don't have $\frac{1}{4}$ (or equivalent) on second line LHS, they will get the correct result, but should lose all A marks.

Question Number	Scheme	Marks
1	$\frac{1}{2}v\frac{\mathrm{d}v}{\mathrm{d}x}=-\frac{k}{x^2}$	M1
	$\frac{1}{4}v^2=\frac{k}{x}\quad(+c)$	M1A1
	$t=0\ \ x=2\ \ v=5\ \Rightarrow\frac{25}{4}=\frac{k}{2}+c$	dM1
	$x=5\ \ v=4\ \Rightarrow\frac{4^2}{4}=\frac{k}{5}+c$	A1
	$k=\frac{15}{2}\quad c=\frac{5}{2}$	dM1A1
	$v^2=\frac{30}{x}+10$	A1 (8)
		[8]

M1	For equation of motion with acceleration in the form $v\frac{\mathrm{d}v}{\mathrm{d}x}$ oe . Must have used a mass.
M1	Separating the variables and integrating. They must have had $v\frac{\mathrm{d}v}{\mathrm{d}x}$ oe
A1	Correct integration, constant not needed. They must have started with a minus sign. Note that *k* is positive since $\frac{k}{x^2}$ is a magnitude.
dM1	Using one of the boundary conditions to form an equation in *k* and *c*. Dependent on the first M1.
A1	Both equations correct
dM1	Solving their equations to find values for *k* and *c*. Dependent on the previous M mark.
A1	Correct values for *k* and *c*
A1	Correct expression for v^2
ALT	-if they use definite integration to find k and then indefinite to find c
	First 3 marks as per the main scheme, then
dM1	$\int_5^4\frac{1}{2}v\,dv=-\int_2^5\frac{k}{x^2}\,dx$
A1	$k=\frac{15}{2}$ from correct working.
dM1	Using indefinite integration and one set of limits to find c.
A1	$c=\frac{5}{2}$ o.e. from correct working.
A1	Correct expression for v^2