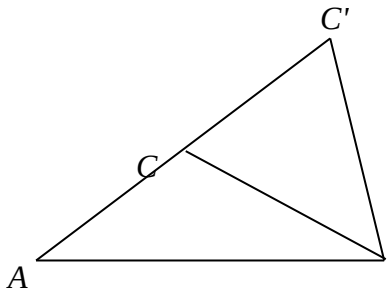
Question Number	Scheme	Marks
1	$16-\left(e^{x}\right)^{2}=6e^{x}$	M1
	$\left(e^{x}\right)^{2}+6e^{x}-16=0$	A1
	$\left(e^{x}+8\right)\left(e^{x}-2\right)=0$	M1
	$\left(e^{x}=-8 \quad \text{(not poss)}\right)$	
	$e^{x}=2 \quad x=\ln 2$	M1A1 [5]
2	$V=\frac{1}{3}\pi r^{2}h=\frac{1}{9}\pi r^{3}$	B1
	$\frac{dV}{dr}=\frac{1}{3}\pi r^{2}$	M1
	$\frac{dr}{dt}=\frac{dV}{dt}\times\frac{dr}{dV}$	M1
	$=50\times\frac{3}{\pi\times10^{2}}$	dM1
	$=0.4774...=0.477$ cm/s	A1 [5]
3 (a)	$\overrightarrow{CD}=\overrightarrow{CO}+\overrightarrow{OD}=\frac{2}{3}\mathbf{b}-\frac{1}{2}\mathbf{a}$	M1A1 (2)
(b)	$\overrightarrow{CE}=\overrightarrow{CO}+\overrightarrow{OE}=-\frac{1}{2}\mathbf{a}+2\mathbf{b}-\mathbf{a}=2\mathbf{b}-\frac{3}{2}\mathbf{a}$	M1A1 (2)
(c)	$\overrightarrow{CE}=2\mathbf{b}-\frac{3}{2}\mathbf{a}=3\left(\frac{2}{3}\mathbf{b}-\frac{1}{2}\mathbf{a}\right)=3\overrightarrow{CD}$	M1
	$\therefore$ *C, D* and *E* are collinear	A1 (2) [6]
	ALT: Use any other pair from $\overrightarrow{CD},\overrightarrow{DE},\overrightarrow{CE}$ M1 complete method; A1 all correct inc conclusion.	
4 (a)	$\tan\theta=3 \quad \tan\theta=-2$	M1
	$\theta=1.2490...=1.249$	A1
	$\theta=2.0344...=2.034$	A1 (3)

Question Number	Scheme	Marks
(b)	$6\left(1-\sin^2\theta\right)-\sin\theta=5$	M1
	$6\sin^2\theta+\sin\theta-1=0$	
	$\left(3\sin\theta-1\right)\left(2\sin\theta+1\right)=0$	M1
	$\sin\theta=\frac{1}{3}\quad\theta=0.33983...\ 2.8017...\quad\theta=0.3398,\ 2.802$	A1A1
		(4)
	$\left(\sin\theta=-\frac{1}{2}\quad\text{no solutions in range}\right)$	
		[7]
5(a)	$\frac{\sin 40}{7}=\frac{\sin C}{10}$	M1A1
	$C=\sin^{-1}\left(\frac{10\sin 40}{7}\right)=66.67...\ ,113.32...$	
	$C=66.7°,\ 113.3°$	A1,A1 (4)
(b)		
	$\Delta CC'B$ is isosceles (seen explicitly or implied by next statement)	M1
	$CC'=2\times 7\cos 66.67$	M1A1ft
	$=5.543...$ cm = 5.54cm (Accept 5.54 (cm) or better)	A1 (4)
		[8]
	NB For longer methods: M1 trig statement; A1ft correct numbers, follow through angle found in (a); M1 complete to...A1 correct answer.	