

Question Number	Scheme	Marks
7(a)	$u = \tan x \rightarrow \frac{du}{dx} = \sec^2 x$ $u^2 = \tan^2 x = \sec^2 x - 1 \rightarrow \int \frac{u+u^3}{(5+u^2)^3} \times \frac{1}{1+u^2} du$ $\int \frac{u}{(5+u^2)^3} du *$	B1 M1dM1 A1*
		(4)
(b)	$\int \frac{u}{(5+u^2)^3} du = -\frac{1}{4}(5+u^2)^{-2} + c = -\frac{1}{4}(5+\tan^2 x)^{-2} (+c)$	M1A1
		(2)
		(6 marks)

Question Number	Scheme	Marks
9(a)	States or uses $V = \pi \times 4^2 \times h \Rightarrow \frac{dV}{dh} = 16\pi$ States or uses $\frac{dV}{dt} = 0.6\pi - 0.15\pi h$ Attempts to use $\frac{dV}{dt} = \frac{dV}{dh} \times \frac{dh}{dt} \Rightarrow 0.6\pi - 0.15\pi h = 16\pi \times \frac{dh}{dt}$ $\frac{dh}{dt} = \frac{12-3h}{320} *$	B1 B1 M1 A1*
(b)	$\frac{dh}{dt} = \frac{12-3h}{320} \Rightarrow \int \frac{dh}{12-3h} = \int \frac{1}{320} dt$ $-\frac{1}{3} \ln(12-3h) = \frac{1}{320} t + c$ Uses $t = 0, h = 0.5 \quad -\frac{1}{3} \ln\left(\frac{21}{2}\right) = c \Rightarrow -\frac{1}{3} \ln(12-3h) = \frac{1}{320} t - \frac{1}{3} \ln\left(\frac{21}{2}\right)$ Substitutes $h = 3.5 \quad -\frac{1}{3} \ln\left(\frac{3}{2}\right) = \frac{1}{320} t - \frac{1}{3} \ln\left(\frac{21}{2}\right) \Rightarrow t = \dots$ 208 minutes cso	(4) M1 A1 M1 A1 dM1 A1 (6)
		(10 marks)

Question Number	Scheme	Marks
1	Attempt at chain rule $y^2 \rightarrow \dots y \frac{dy}{dx}$ Attempt at product rule $3x^2 y \rightarrow \dots x^2 \frac{dy}{dx} + \dots xy$ Correct differentiation $2 - 8y \frac{dy}{dx} + 6xy + 3x^2 \frac{dy}{dx} = 8x$ Substitutes $x = 3, y = 2 \Rightarrow \frac{dy}{dx} = -\frac{14}{11}$ Correct method for normal at $(3, 2) \Rightarrow y - 2 = \frac{11}{14}(x - 3)$ $11x - 14y - 5 = 0$	M1 M1 A1 M1, A1 dM1 A1
		(7)
		(7 marks)