Question number	Scheme	Marks
6 (a)	$x^2 - 5x + 4 = (x-4)(x-1)$	M1
	$A(1,\ 0)$ $B(4,\ 0)$	A1 A1 (3)
	Notes	
(a)		
M1	For solving the quadratic	
A1	For $A(1,\ 0)$	
A1	For $B(4,\ 0)$	
(b)	$\frac{dy}{dx} = 2x - 5$	M1
	When $x = 1$ $\frac{dy}{dx} = -3$	A1
	Tangents meet on the axis of symmetry of curve C so $x = \frac{1+4}{2} = \frac{5}{2}$	M1 A1
	When $x = \frac{5}{2}$ $y = -3\left(\frac{5}{2} - 1\right) = -\frac{9}{2}$	M1
	$\left(\frac{5}{2}, -\frac{9}{2}\right)$	A1
		(6)
	Notes	
(b)		
M1	For $\frac{dy}{dx} = 2x - 5$ (Allow if seen in part(c))	
A1	$\frac{dy}{dx} = -3$ when $x = 1$	
M1	For use of $\frac{x_1 + x_2}{2}$ or $\frac{-b}{2a}$ or $\frac{dy}{dx} = 0$	
A1	$x = \frac{5}{2}$	
M1	For substitution of $x = \frac{5}{2}$ into $y - y_1 = m(x - x_1)$ oe	
A1	For $\left(\frac{5}{2}, -\frac{9}{2}\right)$	

	Alternative Method $\frac{\mathrm{d}y}{\mathrm{d}x} = 2x - 5$ When $x = 1$ $\frac{\mathrm{d}y}{\mathrm{d}x} = -3$ So $y = -3x + 3$ When $x = 4$ $\frac{\mathrm{d}y}{\mathrm{d}x} = 3$ So $y = 3x - 12$ Meet when $-3x + 3 = 3x - 12$ $\left(\frac{5}{2}, -\frac{9}{2}\right)$	 M1 A1 M1 A1 M1 A1 (6)
	Notes	
 M1 **A1** **M1** **A1** **M1** **A1**	**Alternative** For an attempt to find the equation of the tangent of C at A For $y = -3x + 3$ For an attempt to find the equation of the tangent of C at B For $y = 3x - 12$ For equating the two equations For $\left(\frac{5}{2}, -\frac{9}{2}\right)$	

(c)	Gradient of normal at (0, 1) = $\frac{1}{3}$	M1
	When $x=\frac{5}{2}$ $\quad y=\frac{1}{3}\left(\frac{5}{2}-1\right)=\frac{1}{2}$	M1
	$\left(\frac{5}{2},\frac{1}{2}\right)$	A1 (3)
	Alternative Method $y=\frac{1}{3}x-\frac{1}{3}$ and $y=-\frac{1}{3}x+\frac{4}{3}$	M1
	Meet when $\frac{1}{3}x-\frac{1}{3}=-\frac{1}{3}x+\frac{4}{3}$	M1
	$\left(\frac{5}{2},\frac{1}{2}\right)$	A1 (3)

	Notes
(c)	
M1	For Gradient of normal at (0, 1) = $\frac{1}{3}$ ft the gradient found in part (b)
M1	For substitution of $x=\frac{5}{2}$ into $y-y_1=m(x-x_1)$ oe
A1	For $\left(\frac{5}{2},\frac{1}{2}\right)$
	Alternative
M1	For $y=\frac{1}{3}x-\frac{1}{3}$ and $y=-\frac{1}{3}x+\frac{4}{3}$
M1	For equating the two equations
A1	For $\left(\frac{5}{2},\frac{1}{2}\right)$

(d)	Area $= \frac{1}{2}(4-1)\times\left(\frac{1}{2}+\frac{9}{2}\right)=\frac{15}{2}$	M1 M1 A1 (3)
	Alternative Method 1 Area $= \frac{1}{2}\times3\times\frac{1}{2}+\frac{1}{2}\times3\times\frac{9}{2}=\frac{15}{2}$	M1 M1 A1 (3)
	Alternative Method 2 $AN=\sqrt{1.5^2+0.5^2}=\frac{\sqrt{10}}{2}\quad AT=\sqrt{1.5^2+4.5^2}=\frac{3\sqrt{10}}{2}$	M1
	Area $= 2\times\frac{1}{2}\times\frac{\sqrt{10}}{2}\times\frac{3\sqrt{10}}{2}=\frac{30}{4}=\frac{15}{2}$	M1 A1 (3)
	Alternative Method 3 Area $= \frac{1}{2}\begin{vmatrix}1 & \frac{5}{2} & 4 & \frac{5}{2} & 1\\ 0 & -\frac{9}{2} & 0 & \frac{1}{2} & 0\end{vmatrix}\Rightarrow\frac{1}{2}\left(-\frac{9}{2}+2+18-\frac{1}{2}\right)=\frac{15}{2}$	M1 M1 A1 (3)
		[15]

	Notes
(d)	
M1	For $\frac{1}{2}\times AB\times NT$
M1	For $\frac{1}{2}(4-1)\times\left(\frac{1}{2}+\frac{9}{2}\right)$
A1	For $\frac{15}{2}$
	Alternative 1
M1	For area of triangle ANB + area of triangle ATB
M1	For $\frac{1}{2}\times3\times\frac{1}{2}+\frac{1}{2}\times3\times\frac{9}{2}$
A1	$\frac{15}{2}$
	Alternative 2
M1	For finding AN and AT
M1	For $2\times\frac{1}{2}\times AN\times AT$
A1	$\frac{15}{2}$

	Alternative 3
M1	Use of area = $\frac{1}{2}\begin{vmatrix} 1 & a & 4 & c & 1 \\ 0 & b & 0 & d & 0 \end{vmatrix}$ oe where (a, b) and (c, d) are the coordinates of T and N
M1	$\frac{1}{2}\left(-\frac{9}{2}+2+18-\frac{1}{2}\right)$
A1	$\frac{15}{2}$