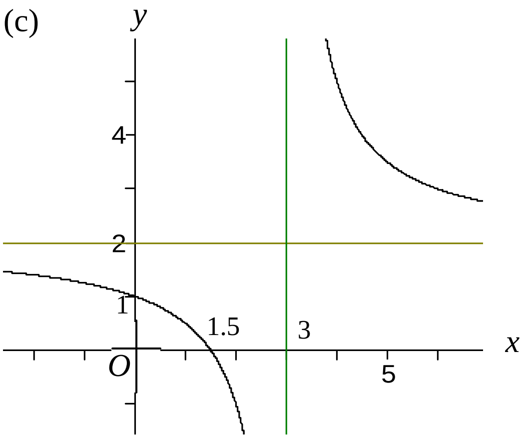
7	(a) *A* (1½ , 0) , B (0 , 1)	B1, B1
	(b) (i) $x = 3$ (ii) $y = 2$	B1 B1
	(c) 	B1 two branches in correct quadrants B1 asymptotes dep on some curve B1 intercepts
	(d) $\frac{dy}{dx} = \frac{2(x-3)-(2x-3)}{(x-3)^2} = \frac{-3}{(x-3)^2}$ At *B*, $x = 0$ so $\frac{dy}{dx} = \frac{-3}{(-3)^2} = -\frac{1}{3}$ Grad of normal = -1/(-1/3) = 3 Normal $y = 3x + 1$	M1 Quotient rule A1 Result (unsimplified) A1 B1ft B1ft
	(e) At *D*, $3x+1 = \frac{2x-3}{x-3}$ $3x^2 - 8x - 3 = 2x - 3$ $3x^2 - 10x = 0$ $x(3x - 10) = 0$ $x = 0$ or $x = 10/3$ At *D*, $x = 3⅓$	M1 A1 M1 A1 **16**

10	(a)	(i) $\overrightarrow{BC} = -\tfrac{1}{2}\mathbf{c} - \mathbf{a} + \mathbf{c} = \tfrac{1}{2}\mathbf{c} - \mathbf{a}$	M1 A1
		(ii) $\overrightarrow{PQ} = \tfrac{3}{4}\mathbf{a} + \tfrac{1}{2}\mathbf{c} + \tfrac{1}{3}(\tfrac{1}{2}\mathbf{c} - \mathbf{a}) = {}^{5}/_{12}\,\mathbf{a} + \tfrac{2}{3}\mathbf{c}$.	M1 $\tfrac{3}{4}\mathbf{a} + \tfrac{1}{2}\mathbf{c} + \ldots$ M1 $\tfrac{1}{3}(\tfrac{1}{2}\mathbf{c} - \mathbf{a})$ A1
	(b)	(i) $\overrightarrow{AT} = -\tfrac{3}{4}\mathbf{a} + \lambda\,({}^{5}/_{12}\,\mathbf{a} + \tfrac{2}{3}\mathbf{c})$	B1ft
		(ii) $\overrightarrow{AT} = \mu\,(\mathbf{c} - \mathbf{a})$	B1
	(c)	$-\tfrac{3}{4}\mathbf{a} + \lambda\,({}^{5}/_{12}\,\mathbf{a} + \tfrac{2}{3}\mathbf{c}) = \mu\,(\mathbf{c} - \mathbf{a})$ $\Rightarrow -\tfrac{3}{4} + {}^{5}/_{12}\,\lambda = -\mu$ and $\tfrac{2}{3}\lambda = \mu$ $\Rightarrow {}^{5}/_{12}\,\lambda = \tfrac{3}{4} - \tfrac{2}{3}\lambda$ $\Rightarrow 5\lambda = 9 - 8\lambda$ $\Rightarrow \lambda = {}^{9}/_{13}$ $\Rightarrow PT : TQ = 9 : 4$	M1 M1 A1ft M1 A1 A1ft **13**
11	(a)	$V = \pi\int_0^h x^2\,dy = \pi\int_0^h (10y - y^2)\,dy$ $= \pi\left[5y^2 - \tfrac{1}{3}y^3\right]_0^h$ $= \pi\left[5h^2 - \tfrac{1}{3}h^3\right]$ $= 1/3\ \pi h^2(15 - h)$	M1 use of $\int \pi x^2\,dy$ M1 A1 integration M1 use of correct limits A1 cso
	(b)	$V = \pi(5h^2 - \tfrac{1}{3}h^3) \Rightarrow \dfrac{dV}{dh} = \pi(10h - h^2)$	B1 oe
	(c)	$\dfrac{dV}{dt} = \pi(10h - h^2)\dfrac{dh}{dt}$ When h=1.5, $6 = \pi(15 - 2.25)\ {}^{dh}/_{dt}$ $\Rightarrow {}^{dh}/_{dt} = 6/(12.75\pi) = 0.150$ cm/s (3sf)	M1 chain rule M1 A1 substitution A1 cao
	(d)	$W = \pi x^2 = \pi(10y - y^2)$ When depth is h, $W = \pi(10h - h^2)$ $\dfrac{dV}{dt} = \pi(10h - h^2)\dfrac{dh}{dt} = W\dfrac{dh}{dt}$ Since ${}^{dV}/_{dt} = 6$, ${}^{dh}/_{dt} = 6/W$ so $k = 6$	B1 M1 A1 **13**