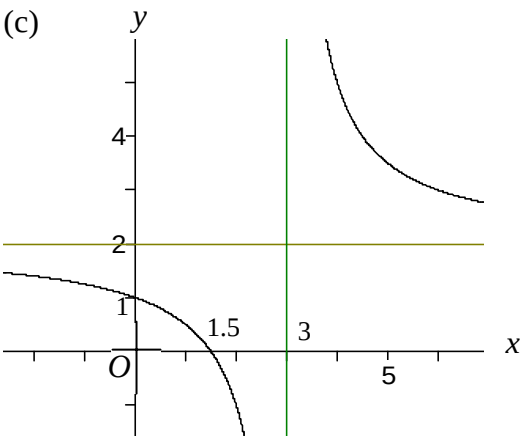
January 2012 International GCSE Mathematics (4PM0) Paper 01 Mark Scheme

Question	Working	Notes
1	$y = -{}^{6}/_{4}\,x - {}^{15}/_{4}$, gradient = $-{}^{3}/_{2}$ oe $y = {}^{10}/_{15}\,x - {}^{9}/_{15}$, gradient = ${}^{2}/_{3}$ oe Product of gradients = $-{}^{3}/_{2} \times {}^{2}/_{3} = -1 \Rightarrow$ lines perpendicular	M1 A1 A1 A1 **4**
2	$x(x + 2) - (x + 1) = 2(x + 1)(x + 2)$ $x^2 + x - 1 = 2x^2 + 6x + 4$ $x^2 + 5x + 5 = 0$ $x = \dfrac{-5 \pm \sqrt{25 - 20}}{2}$ = -3.62 , -1.38	M1 A1 M1 A1 **4**
3	$(3x + 1)(2x - 7) < 0$ $-\frac{1}{3} < x < 3\frac{1}{2}$	M1 A1 M1 A1 **4**
4	$\dfrac{10!}{7!3!}1^3\left(\dfrac{1}{\sqrt{3}}\right)^7$ $= 120\dfrac{1}{27\sqrt{3}}$ $= 120\dfrac{1}{27}\dfrac{\sqrt{3}}{3}$ $= \dfrac{40}{27}\sqrt{3}$	Allow all marks if x^7 included. M1 A1 M1 rationalise A1 **4**
5	(a) $\dfrac{dy}{dx} = x^2e^x + 2xe^x$ (b) $\dfrac{dy}{dx} = 5(x^3 + 2x^2 + 3)^4(3x^2 + 4x)$	M1 two terms with one correct A1 M1 use chain rule A1 $5(x^3 + 2x^2 + 3)^4$ A1 $(3x^2 + 4x)$ **5**

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