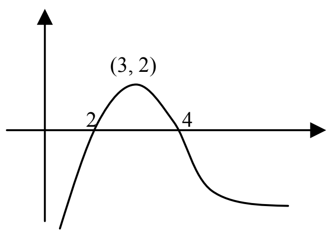
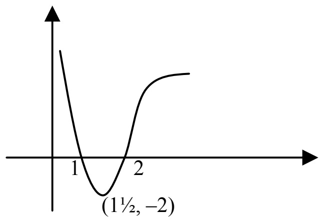
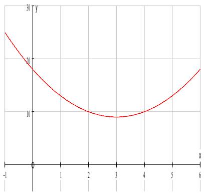
January 2005
6663 Core Mathematics C1
Mark Scheme

Question number	Scheme	Marks
1.	(a) 4 (or $\pm$ 4)	B1
	(b) $16^{-\frac{3}{2}} = \frac{1}{16^{\frac{3}{2}}}$ and any attempt to find $16^{\frac{3}{2}}$	M1
	$\frac{1}{64}$ (or exact equivalent, e.g. 0.015625) (or $\pm\frac{1}{64}$)	A1 (3)
		3
2.	(i) (a) $15x^2 + 7$	M1 A1 A1 (3)
	(i) (b) $30x$	B1ft (1)
	(ii) $x + 2x^{\frac{3}{2}} + x^{-1} + C$ A1: $x + C$, A1: $+2x^{\frac{3}{2}}$, A1: $+x^{-1}$	M1 A1 A1 A1(4)
		8
3.	Attempt to use discriminant $b^2 - 4ac$ Should have no x's	M1
	(Need not be equated to zero) (Could be within the quadratic formula)	
	$144 - 4 \times k \times k = 0$ or $\sqrt{144 - 4 \times k \times k} = 0$	A1
	Attempt to solve for k (Could be an inequality)	M1
	$k = 6$	A1 (4)
		4
4.	$x^2 + 2(2 - x) = 12$ or $(2 - y)^2 + 2y = 12$ (Eqn. in x or y only)	M1
	$x^2 - 2x - 8 = 0$ or $y^2 - 2y - 8 = 0$ (Correct 3 term version)	A1
	(Allow, e.g. $x^2 - 2x = 8$)	
	$(x - 4)(x + 2) = 0$ $x = \ldots$ or $(y - 4)(y + 2) = 0$ $y = \ldots$	M1
	$x = 4$, $x = -2$ or $y = 4$, $y = -2$	A1
	$y = -2$, $y = 4$ or $x = -2$, $x = 4$ (M: attempt one, A: both)	M1 A1ft (6)
		6

Question number	Scheme	Marks	
5.	(a) $-3, \ -1, \ 1$ B1: One correct	B1 B1	(2)
	(b) 2 (ft only if terms in (a) are in arithmetic progression)	B1ft	(1)
	(c) Sum = $\frac{1}{2}n\{2(-3)+(n-1)(2)\}$ or $\frac{1}{2}n\{(-3)+(2n-5)\}$	M1 A1ft	
	$= \frac{1}{2}n\{2n-8\} = n(n-4)$ (Not just n^2-4n) (*)	A1	(3)
		6	
6.	(a)  Reflection in x-axis, cutting x-axis twice.	B1	
	2 and 4 labelled (or (2, 0) and (4, 0) seen)	B1	
	Image of P (3, 2)	B1	(3)
	(b)  Stretch parallel to x-axis	M1	
	1 and 2 labelled (or (1, 0) and (2, 0) seen)	A1	
	Image of P (1½, –2)	A1	(3)
		6	
7.	(a) $\frac{5-x}{x} = \frac{5}{x} - \frac{x}{x} \left(= \frac{5}{x} - 1 \right) \left(= 5x^{-1} - 1 \right)$	M1	
	$\frac{dy}{dx} = 8x, -5x^{-2}$	M1 A1, A1	
	When $x = 1$, $\frac{dy}{dx} = 3$ (*)	A1 cso	(5)
	(b) At P, $y = 8$	B1	
	Equation of tangent: $y - 8 = 3(x-1)$ ($y = 3x + 5$) (or equiv.)	M1 A1ft	(3)
	(c) Where $y = 0$, $x = -\frac{5}{3}$ ($= k$) (or exact equiv.)	M1 A1	(2)
		10	

Question number	Scheme	Marks
8.	(a) $p = 15, \quad q = -3$	B1 B1 (2)
	(b) Grad. of line *ADC*: $m = -\frac{5}{7}$, Grad. of perp. line $= -\frac{1}{m} \left(= \frac{7}{5} \right)$	B1, M1
	Equation of l: $y - 2 = \frac{7}{5}(x - 8)$	M1 A1ft
	$7x - 5y - 46 = 0$ (Allow rearrangements, e.g. $5y = 7x - 46$)	A1 (5)
	(c) Substitute $y = 7$ into equation of l and find $x = \ldots$	M1
	$\frac{81}{7}$ or $11\frac{4}{7}$ (or exact equiv.)	A1 (2)
		9
9.	(a) Evaluate gradient at $x = 1$ to get 4, Grad. of normal $= -\frac{1}{m} \left(= -\frac{1}{4} \right)$	B1, M1
	Equation of normal: $y - 4 = -\frac{1}{4}(x - 1)$ $(4y = -x + 17)$	M1 A1 (4)
	(b) $(3x - 1)^2 = 9x^2 - 6x + 1$ (May be seen elsewhere)	B1
	Integrate: $\frac{9x^3}{3} - \frac{6x^2}{2} + x \; (+C)$	M1 A1ft
	Substitute (1, 4) to find $c = \ldots$, $c = 3$ $(y = 3x^3 - 3x^2 + x + 3)$	M1, A1cso (5)
	(c) Gradient of given line is –2	B1
	Gradient of (tangent to) C is ≥ 0 (allow >0), so can never equal –2.	B1 (2)
		11

Question number	Scheme		Marks	
10.	(a) $x^2 - 6x + 18 = (x-3)^2, \ +9$		B1, M1 A1	(3)
	(b) 	"U"-shaped parabola	M1	
		Vertex in correct quadrant	A1ft	
		P: (0, 18) (or 18 on y-axis)	B1	
		Q: (3, 9)	B1ft	(4)
	(c) $x^2 - 6x + 18 = 41$ or $(x-3)^2 + 9 = 41$		M1	
	Attempt to solve 3 term quadratic $x = \ldots$		M1	
	$x = \dfrac{6 \pm \sqrt{36 - (4 \times -23)}}{2}$	(or equiv.)	A1	
	$\sqrt{128} = \sqrt{64} \times \sqrt{2}$	(or surd manipulation $\sqrt{2a} = \sqrt{2}\sqrt{a}$)	M1	
	$3 + 4\sqrt{2}$		A1	(5)
				12