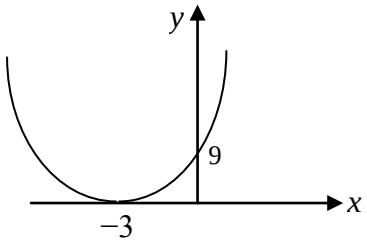
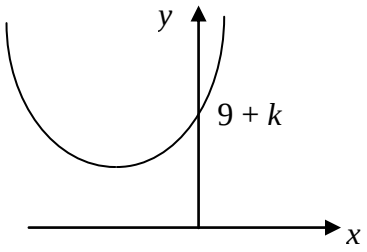
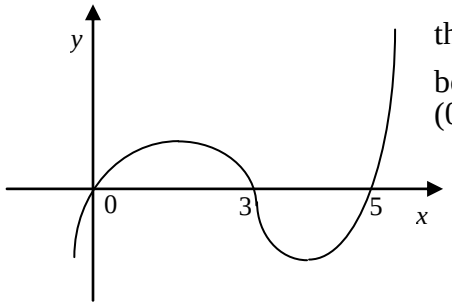
June 2006
6663 Core Mathematics C1
Mark Scheme

Question number	Scheme	Marks
1.	$\frac{6x^3}{3}+2x+\frac{x^{\frac{1}{2}}}{\frac{1}{2}}$ $(+c)$ $= 2x^3+2x+2x^{\frac{1}{2}}$ $+c$ for some attempt to integrate $x^n \to x^{n+1}$	M1 A1 A1 B1 **Total 4 marks**
2.	Critical Values $(x\pm a)(x\pm b)$ with ab= 18 or $x=\frac{7\pm\sqrt{49--72}}{2}$ or $\left(x-\frac{7}{2}\right)^2\pm\left(\frac{7}{2}\right)^2-18$ $(x-9)(x+2)$ or $x=\frac{7\pm11}{2}$ or $x=\frac{7}{2}\pm\frac{11}{2}$ Solving Inequality $x>9$ or $x<-2$ Choosing "outside"	 M1 A1 M1 A1 **Total 4 marks**
3.	 U shape touching x-axis $(-3, 0)$ $(0, 9)$  Translated parallel to y-axis up $(0, 9+k)$	 B1 B1 B1 (3) B1f.t. (2) **Total 5 marks**

Question number	Scheme	Marks
4. (a)	$a_2 = 4$ $a_3 = 3 \times a_2 - 5 = 7$	B1 B1f.t. (2)
(b)	$a_4 = 3a_3 - 5(=16)$ and $a_5 = 3a_4 - 5(=43)$ $3 + 4 + 7 + 16 + 43$ $= 73$	M1 M1 A1c.a.o. (3) **Total 5 marks**
5. (a)	$(y = x^4 + 6x^{\frac{1}{2}} \Rightarrow y' =)\ 4x^3 + 3x^{-\frac{1}{2}}$ or $4x^3 + \frac{3}{\sqrt{x}}$	M1A1A1 (3)
(b)	$(x+4)^2 = x^2 + 8x + 16$ $\frac{(x+4)^2}{x} = x + 8 + 16x^{-1}$ (allow 4+ 4 for 8) $(y = \frac{(x+4)^2}{x} \Rightarrow y' =)\ 1 - 16x^{-2}$ o.e.	M1A1 (4) **Total 7 marks**
6. (a)	$16 + 4\sqrt{3} - 4\sqrt{3} - \left(\sqrt{3}\right)^2$ or $16 - 3$ $= 13$	M1 A1c.a.o (2)
(b)	$\frac{26}{4+\sqrt{3}} \times \frac{4-\sqrt{3}}{4-\sqrt{3}}$ $= \frac{26(4-\sqrt{3})}{13} = \underline{8 - 2\sqrt{3}}$ or $8 + (-2)\sqrt{3}$ or $a = 8$ and $b = -2$	M1 A1 (2) **Total 4 marks**

Question number	Scheme	Marks
7.	$a + (n-1)d = k$ $\quad k = 9$ or 11 $(u_{11} =)\ a+10d = 9$ $\frac{n}{2}[2a+(n-1)d] = 77$ or $\frac{(a+l)}{2}\times n = 77$ $\quad l = 9$ or 11 $(S_{11} =)\ \frac{11}{2}(2a+10d) = 77$ or $\frac{(a+9)}{2}\times 11 = 77$ e.g. $a + 10d = 9$ $a + 5d = 7$ or $a + 9 = 14$ $a = 5$ and $d = 0.4$ or exact equivalent	M1 A1c.a.o. M1 A1 M1 A1 A1 **Total 7 marks**
	ALT Uses $\frac{(a+l)}{2}\times n = 77$ to get $a = 5$, gets second and third M1A1 i.e. 4/7 Then uses $\frac{n}{2}[2a+(n-1)d] = 77$ to get d, gets 1st M1A1 and 4th A1 MR Consistent MR of 11 for 9 leading to $a = 3$, $d = 0.8$ scores M1A0M1A0M1A1ftA1ft	
8. (a)	$b^2 - 4ac = 4p^2 - 4(3p+4) = 4p^2 - 12p - 16\ (= 0)$ or $(x+p)^2 - p^2 + (3p+4) = 0 \Rightarrow p^2 - 3p - 4(= 0)$ $(p-4)(p+1) = 0$ $p =$ (-1 or) 4	M1, A1 M1 A1c.s.o. (4)
(b)	$x = \frac{-b}{2a}$ or $(x+p)(x+p) = 0 \Rightarrow x = ...$ $x\ (= -p) =$ $\underline{-4}$	M1 A1f.t. (2) **Total 6 marks**

Question number		Scheme	Marks
9.	(a)	f(x) = $x[(x-6)(x-2)+3]$ or $x^3 - 2x^2 + 12x + 3x = x$	M1
		f(x) = $x(x^2 - 8x + 15)$ $b = -8$ or $c = 15$	A1
		both and $a = 1$	A1 (3)
	(b)	$(x^2 - 8x + 15) = (x-5)(x-3)$	M1
		f(x) = $x(x-5)(x-3)$	A1 (2)
		 Shape	B1
		their 3 or their 5	B1f.t.
		both their 3 and their 5 and $(0,0)$ by implication	B1f.t. (3)
			Total 8 marks
10.	(a)	f(x) = $\frac{2x^2}{2} + \frac{3x^{-1}}{-1}(+c)$ $-\frac{3}{x}$ is OK	M1A1
		$(3, 7\frac{1}{2})$ gives $\frac{15}{2} = 9 - \frac{3}{3} + c$ 3^2 or 3^{-1} are OK instead of 9 or $\frac{1}{3}$	M1A1f.t.
		$c = -\frac{1}{2}$	A1 (5)
	(b)	f(-2) = $4 + \frac{3}{2} - \frac{1}{2}$ (*)	B1c.s.o. (1)
		$m = -4 + \frac{3}{4}$, $= -3.25$	M1, A1
		Equation of tangent is: $y - 5 = -3.25(x + 2)$	M1
		$4y + 13x + 6 = 0$ o.e.	A1 (4)
			Total 10 marks

Question number		Scheme	Marks
11.	(a)	$m = \frac{8-2}{11+1}$ $(=\frac{1}{2})$	M1 A1
		$y - 2 = \frac{1}{2}(x - -1)$ or $y - 8 = \frac{1}{2}(x - 11)$ o.e.	M1
		$y = \frac{1}{2}x + \frac{5}{2}$ accept exact equivalents e.g. $\frac{6}{12}$	A1c.a.o. (4)
	(b)	Gradient of $l_2 = -2$	M1
		Equation of l_2: $y - 0 = -2(x - 10)$ $[y = -2x + 20]$	M1
		$\frac{1}{2}x + \frac{5}{2} = -2x + 20$	M1
		$x = 7$ and $y = 6$ depend on all 3 Ms	A1, A1 (5)
	(c)	$RS^2 = (10-7)^2 + (0-6)^2 (= 3^2 + 6^2)$	M1
		$RS = \sqrt{45} = 3\sqrt{5}$ (*)	A1c.s.o. (2)
	(d)	$PQ = \sqrt{12^2 + 6^2}, = 6\sqrt{5}$ or $\sqrt{180}$ or $PS = 4\sqrt{5}$ and $SQ = 2\sqrt{5}$	M1, A1
		Area = $\frac{1}{2}PQ \times RS = \frac{1}{2}6\sqrt{5} \times 3\sqrt{5}$	dM1
		= 45	A1 c.a.o. (4)
			Total 15 marks