6663 Core Mathematics C1 – January 2005

1. (*a*) 4 (*b*) $\frac{1}{64}$

2. (i) (*a*) $15x^2 + 7$ (*b*) $30x$ (ii) $x + 2x^{\frac{3}{2}} + x^{-1} + C$

3. $k = 6$

4. $x = 4, x = -2$; $y = 4, y = -2$

5. (*a*) $-3, -1, 1$ (*b*) 2

7. (*b*) $y - 8 = 3(x - 1)$ (*c*) $k = -\frac{5}{3}$

8. (*a*) $p = 15, q = -3$ (*b*) $y - 2 = \frac{7}{5}(x - 8)$ (*c*) $11\frac{4}{7}$

9. (*a*) $y - 4 = \frac{1}{4}(x - 1)$ (*b*) $y = 3x^3 - 3x^2 + x + 3$

10. (*a*) $(x - 3)^2 + 9$ (*b*) $P(0, 18)$; $Q(3, 9)$ (*c*) $3 + 4\sqrt{2}$

6663 Core Mathematics C1 – June 2005

1. (*a*) 2 (*b*) $\frac{1}{4}$

2. (*a*) $6 + 8x^{-3}$ (*b*) $\frac{6x^2}{2} + 4x^{-1} + c$

3. (*a*) $a = -4$; $b = -45$

4. (*a*) $(3, 15)$, $x = 6$; (*b*) $(1, 5)$, $x = 4$

5. $y = 2, x = 5$; $y = -\frac{14}{5}, x = -\frac{23}{5}$

6. (*a*) $x > \frac{1}{4}$ (*b*) $x > 3$ or $x < \frac{1}{2}$ (*c*) $x > 3$ or $\frac{1}{4} < x < \frac{1}{2}$

7. (*b*) $y = 18x^{\frac{1}{2}} - 6x + \frac{2}{3}x^{\frac{3}{2}} - 12$

8. (*a*) $3y - x + 21 = 0$ (*b*) $(3, 6)$ (*c*) 10.5

9. (*b*) £109 (*d*) $n = 50$ or 100

(*e*) $u_{100} < 0$ $\therefore n = 100$ not sensible

10. (*b*) $y = -7x + 21$ (*c*) $(5, -\frac{46}{3})$

6663 Core Mathematics C1 – January 2006

1. $x(x-3)(x-1)$

2. (*a*) $u_2 = 4$, $u_3 = 1$ $u_4 = 4$; (*b*) $u_{20} = 4$

3. (*b*) $x - 2y - 5 = 0$

4. (*a*) $4x + 18x^{-4}$; (*b*) $\frac{2x^3}{3} - \frac{6x^{-2}}{-2} + C$

5. (*a*) $3\sqrt{5}$; (*b*) $7 + 3\sqrt{5}$

7. (*b*) £1 900 (*c*) £9 600 (*d*) 26

8. $3x + 2x^{\frac{5}{2}} + 4x^{\frac{1}{2}} - 3$

9. (*a*) –2(*P*), 2(*Q*) (*d*) $x = \frac{5}{3}; y = \frac{22}{27}$

10. (*a*) $a = 1; b = 2$ (*c*) −8 (*d*) $-\sqrt{12} < k < \sqrt{12}$

6663 Core Mathematics C1 – June 2006

1. $2x^3 + 2x + 2x^{\frac{1}{2}} + c$

2. $x > 9$ or $x < -2$

3. (*a*) (−3, 0); (0, 9) (*b*) (0, 9 + *k*)

4. (*a*) $a_2 = 4$; $a_3 = 7$; (*b*) 73

5. (*a*) $4x^3 + \frac{3}{\sqrt{x}}$; (*b*) $1 - 16x^{-2}$

6. (*a*) 13 (*b*) $8 + (-2)\sqrt{3}$

7. $a = 5$; $d = 0.4$

8. (*a*) $p = (-1 \text{ or } 4)$ (*b*) −4

9. (*a*) $x(x^2 - 8x + 15)$ (*b*) $x(x-5)(x-3)$

10. (*a*) $c = -\frac{1}{2}$ (*c*) $4y + 13x + 6 = 0$

11. (*a*) $y = \frac{1}{2}x + \frac{5}{2}$ (*b*) (7, 6) (*d*) 45

6663 Core Mathematics C1 – January 2007

1. $12x^2 + x^{-\frac{1}{2}}$

2. (*a*) $6\sqrt{3}$ (*b*) $7 - 4\sqrt{3}$

3. (*b*) $(0, -\frac{1}{3})$

4. $x = -1, y = -3$ or $x = 3, y = 1$

5. $k = < -\frac{17}{8}$

6. (*b*) $16x + \frac{9x^2}{2} + 16x^{\frac{3}{2}}$

7. (*a*) $x^3 - 6x + \frac{8}{x} + 1$ (*b*) $y = 4x - 7$

8. (*b*) $4 + \frac{9x^{\frac{1}{2}}}{2} - 4x$ (*d*) $8\sqrt{10}$

9. (*a*) $3n + 1$ (*b*) 175 (*d*) $k = 33$

10. (*b*) (–2, –16) and (3, 9)

6663 Core Mathematics C1 – June 2007

1. 4

2. (*a*) 16 (*b*) $5x^{\frac{1}{3}}$

3. (*a*) $6x + 2x^{-\frac{1}{2}}$ (*b*) $6 + -1 \times x^{-\frac{3}{2}}$ (*c*) $x^3 + \frac{8}{3}x^{\frac{3}{2}} + C$

4. (*a*) £4.03 (*b*) £408

5. (*b*) $x = -2, y = 0$

6. (*b*) $x = -2 + 2\sqrt{3}$, $y = -6 + 2\sqrt{3}$

7. (*b*) $k < -2, k > 6$

8. (*a*) $a_2 = 3k + 5$

(*c*) (i) $\sum_{r=1}^{4} a_r = k + (3k + 5) + (9k + 20) + (27k + 65)$

9. (*a*) $f(x) = \frac{6x^3}{3} - \frac{10x^2}{2} - 12x \ (+ C)$

10. (*c*) $x - 13y - 14 = 0$

11. (*a*) $y = -\frac{3}{2}$ (*b*) $\left(\frac{4}{9}, \frac{10}{3}\right)$ (*d*) $2\frac{13}{18}$

6663 Core Mathematics C1 – January 2008

1. $x^3 + \frac{2x^6}{3} - 7x$

2. (*a*) 2 (*b*) $8x^9$

3. $13 - 7\sqrt{3}$

4. (*a*) $x + 2y - 2 = 0$ (*b*) $7\sqrt{5}$

5. (*a*) $2x^{-\frac{1}{2}} + 3x^{-1}$ (*b*) $x^{-\frac{3}{2}} - 3x^{-2}$

6. (*c*) $a = 2$

7. (*a*) $p + 1$ (*b*) $p = -\frac{3}{2}$ (*c*) $x_{2008} = -\frac{1}{2}$

8. (*b*) $-8 < k < 4$

9. (*a*) $f(x) = 2x^2 - 4x^{\frac{3}{2}} - 8x + 3$ (*b*) $y - 1 = -\frac{2}{9}(x - 4)$

10. (*c*) $x = \frac{4}{3}$, $x = 2$

11. (*a*) –6 (*b*) $r = 21$ (*c*) 315

6663 Core Mathematics C1 – June 2008

1. $2x + \frac{5}{3}x^3 + c$

2. $x(x + 3)(x - 3)$

4. (*a*) $f'(x) = 3 + 3x^2$ (*b*) $x = 2$

5. (a) $a - 3$ (*c*) $a = 5$ or -2

6. (*b*) (–3, –1) and ($\frac{1}{2}$, 6)

7. (*b*) $2n + 3$ (*d*) 20 (*e*) 480 km

8. (*b*) $-8 < q < 0$

9. (*a*) $3kx^2 - 2x + 1$ (*b*) $k = 2$
(*c*) $y = -6$

10. (a) $a = 3$ (*b*) $y = 2x + 1$ (*c*) (0, 1) (d) 7.5

11. (*b*) $y = \frac{x^3}{3} + 6x - 9x^{-1} - 4$

6663 Core Mathematics C1 – January 2009

1. (*a*) 5 (*b*) $\frac{1}{25}$ or 0.04

2. (*a*) $2x^6 - 2x^4 + 3x + c$

3. 3

4. (*a*) $f(x) = x^3 - 2x^{\frac{3}{2}} - 7x + 2$

6. (*a*) $p = \frac{3}{2}$ $q = 1$

(*b*) $20x^3 + 3x^{\frac{1}{2}} - 1$

7. (*b*) $k < 1$ or $k > 4$

8. (*a*) $a = 4$ (*c*) 2

9. (*a*) $a + 17d = 25$ and $a + 20d = 32.5$
(*b*) $d = 2.5$ so $a = -17.5$
(*d*) $n = 55$

10. (*a*) $y = -\frac{1}{2}x + 6$ (*c*) $2\sqrt{5}$

11. (*a*) $y = \frac{1}{2}x - 4$ or $\frac{y+3}{x+2} = \frac{1}{2}$ (*c*) $\frac{45}{4}$ or 11.25

6663 Core Mathematics C1 – June 2009

1. (*a*) 63 (*b*) 11, $-6\sqrt{5}$

2. (*a*) $\frac{11}{2}$ $\left(\text{or } 5\frac{1}{2} \text{ or } 5.5\right)$

3. (*a*) $\frac{dy}{dx} = 6x^2 - 6x^{-3}$ (*b*) $\frac{x^4}{2} - 3x^{-1} + C$

4. (*a*) $5x > 10$, $x > 2$ (*b*) $-\frac{3}{2} < x < 4$ (*c*) $2 < x < 4$

5. (*a*) –60 (*b*) 2940 (*c*) 70 800

6. (*a*) $\frac{4}{9}$

7. (*a*) $2k - 7$ (*c*) 8

8. (*a*) $2x - 5y + 23 = 0$ (*b*) $\left(0, \frac{23}{5}\right)$ or $(0,4.6)$ (*c*) $\frac{92}{5}$

9. (*a*) $f'(x) = -\frac{9}{2}x^{-\frac{3}{2}} + \frac{16}{2}x^{-\frac{1}{2}}$ (*b*) $\frac{5}{2}$

10. (*a*) $x(x-3)(x-3)$

11. (*b*) $y = 3x + 1$

6663 Core Mathematics C1 – January 2010

1. $\frac{1}{3}x^{\frac{2}{3}}$

2. (*a*) 16, $-4\sqrt{5}$ (*b*) $4-\sqrt{5}$

3. (*a*) $-\frac{3}{5}$ (*b*) $y=\frac{5}{3}x-4$

4. $y=10x^{\frac{1}{2}}+\frac{2x^{\frac{5}{2}}}{5}+\frac{11}{5}$

5. $y=-2$, $y=10$, $x=\frac{1}{3}$, $x=4$

6. (*a*) $1+24x^{-2}$ (*b*) $y+15=7(x-2)$

7. (*a*) £240 (*b*) £4 900 (*c*) $A=205$

9. (*a*) $x(x-2)(x+2)$, (*c*) $y=3x+6$

10. (*a*) $(x+2k)^2-4k^2+(3+11k)$ (*b*) $-\frac{1}{4}<k<3$

6663 Core Mathematics C1 – June 2010

1. $2\sqrt{3}$

2. $2x^4+4x^{\frac{3}{2}}-5x+c$

3. (*a*) $x<2.8$ (*b*) $-1<x<\frac{7}{2}$ (*c*) $-1<x<2.8$

4. (*c*) –8

5. (*a*) $a_2=\sqrt{7}$ (*b*) $a_3=\sqrt{10}$

6. (*c*) $a=5$

7. (*a*) $\frac{dy}{dx}=24x-2x^{-\frac{1}{2}}+3-2x^{-2}$

8. (*a*) $4x-5y-8=0$ (*b*) $\sqrt{41}$ (*c*) $t=8$ (*d*) 20

9. (*a*) $a=40.75-29d$ (*c*) $a=26\frac{1}{4}$, $d=\frac{1}{2}$

10. (*c*) $(4-2\sqrt{3}, -12+8\sqrt{3})$

11. (*a*) $f(x)=\frac{3}{2}x^2-10x^{\frac{1}{2}}-2x+9$ (*b*) $-15x+2y+50=0$

6663 Core Mathematics C1 – January 2011

1. (*a*) 0.5 (*b*) 16

2. $2x^6 - x^3 + 3x^{\frac{4}{3}} + c$

3. $-\frac{1}{2} + \frac{3}{2}\sqrt{3}$

4. (*a*) $a_2 = 6 - c$ (*b*) $c = 5.2$

5. (*b*) $\left(0, \frac{1}{3}\right)$

6. (*b*) $a + 5d = 17$ (*b*) $a = 9$, $d = 1.6$

7. $f(x) = 4x^3 - 4x^2 + x + 9$

8. (*b*) $k > 1$ and $k < -3$

9. (*a*) $k = 5$ (*b*) $\frac{3}{2}$ (*c*) $3y + 2x - 14 = 0$ (*d*) (7, 0)
(*e*) $2\sqrt{13}$

10. (*b*) 2 solutions since only 2 intersections

11. (a) $\frac{3}{2}x^2 - \frac{27}{2}x^{\frac{1}{2}} - 8x - 2$ (c) $7y - 2x + 64 = 0$

6663 Core Mathematics C1 – June 2011

1. (*a*) 5 (*b*) $\frac{1}{125}$ or 0.008

2. (a) $10x^4 - 3x^{-4}$ (*b*) $\frac{x^6}{3} + 7x - \frac{3}{x^4}$

3. $5x - 3y - 11 = 0$

4. $x = \frac{1}{3}$, $y = \frac{5}{3}$; $x = 5$, $y = -3$

5. (*a*) $5k + 3$ (*c*) (i) $156k + 114$
(ii) each term divisible by 6

6. (*a*) $p = \frac{1}{2}$, $q = 2$ (*b*) $y = 4x^{\frac{3}{2}} + x^3 - 6$

7. (*a*) $(k + 3)^2 - 4k$ (*b*) $(k + 1)^2 = 8$

9. (*a*) 2550 (*b*) (i) $\frac{100}{k}$ (*c*) $100k + 148$

10. (*c*) $y = 20x + 84$ (*d*) $x = \frac{1}{3}$

6663 Core Mathematics C1 – January 2012

1. (*a*) $4x^3 + 3x^{-\frac{1}{2}}$ (*b*) $\frac{x^5}{5} + 4x^{\frac{3}{2}} + c$

2. (*a*) $7\sqrt{2}$ (*b*) $3\sqrt{2} - 2$

3. (*a*) $x > 4$ (*b*) $x < -2,\ x > 6$

4. (*a*) $x_2 = a + 5$ (*c*) $a = 4,\ a = -9$

5. (b) Curve passes through (0, 0) and (5, 0);
Line passes through (0, 2) and (–0.8, 0).

6. (*a*) $\frac{2}{3}$ (*b*) $y - 4 = -\frac{3x}{2}$ (*c*) $17\frac{1}{3}$

7. $f(1) = \frac{5}{2}$

8. (*a*) $3x^2 + 4x$ (*c*) 4, 0

9. (*b*) $T = 400$ (*c*) $P = £24\,450$

10. (a) $(\frac{1}{2}, 0)$ (c) $(-8, \frac{17}{8})$

6663 Core Mathematics C1 – June 2012

1. $2x^3 - 2x^{-1} + 5x + c$

2. (a) 8 (*b*) $\frac{2}{5x^2}$

3. $\sqrt{3} + \sqrt{2}$

4. (a) $15x^2 - 8x^{\frac{1}{3}} + 2$ (*b*) $30x - \frac{8}{3}x^{-\frac{2}{3}}$

5. (*a*) $6 - c$ (*c*) $c \leq 2$

6. (*a*) £0.80 (*b*) £94.50 (*d*) $m = 35$

7. (*a*) $y = 2x - 9$ (*b*) $f(x) = \frac{x^2}{4} - 12\sqrt{x} + 3x + 7$

8. (*a*) $p = -1,\ q = 2$ (*b*) –4 (*c*) (0, –5)

9. (*a*) $p = 9.5$ (*b*) $2x + y - 8 = 0$ (*c*) (3.5, 1) (*e*) 45

10. (*a*) (4.5, 0)
(*b*) (i) (–3, 0), (0, 27) maximum, (1.5, 0)
(ii) (0, 0), (1, 27) maximum, (1.5, 0)
(*c*) $k = -17$

6663 Core Mathematics C1 – January 2013

1. $x(1-2x)(1-2x)$

2. 2^{6x+9}

3. (i) $1+3\sqrt{2}$ (ii) $10\sqrt{5}$

4. (*a*) $u_3 = 17,\ u_4 = 33$ (*b*) $\sum_{r=1}^{4} u_r = 64$

5. (*a*) $x - 2y + 7 = 0$

(*b*) x-coordinate of $A = -7$, y-coordinate of $B = \frac{7}{2}$

(*c*) Area $OAB = \frac{49}{4}$ units^2

6. (*b*) $x = 0,\ y = -5$ (*c*) $(-2, -6)$ and $(\frac{1}{4}, 3)$

7. (*a*) $T_{20} = 520$ (*b*) 6600 (*c*) $n = 17$

8. $y = -\frac{1}{4}x^4 - 2x^{-1} + \frac{5}{4}x^{-2} + 8$

9. (*b*) $-4 < k < 6$

10. (*a*) $a = 4,\ b = 1,\ c = -1$

11. (*a*) $\frac{dy}{dx} = 2 - 4x^{-\frac{1}{2}}$ $(x > 0)$

(*b*) $y = -6x + 3$ (*c*) $(9, -1)$

6663 Core Mathematics C1 – June 2013

1. $3 + 2\sqrt{5}$

2. $2x^5 - 2x^2 - 6x^{\frac{1}{2}} + c$

3. (*a*) 32 (*b*) $2x^{-\frac{1}{2}}$

4. (a) $6k$ (*b*) $k = -\frac{1}{3}$, $k = -1$

5. (*a*) $x > -1$ (*b*) $-3 < x < \frac{1}{3}$

6. (*a*) $4y - 3x - 15 = 0$ (*b*) $x = 3,\ y = 6$

7. (*a*) $N = 21$ (*b*) 27 000

8. (*b*) $(x+5)^2(x+1)$ (*c*) When $x = 0$, $y = 25$

9. (*a*) $9x^{-2} - 6 + x^2$ (*b*) $-18x^{-3} + 2x$ (*c*) $-9x^{-1} - 6x + \frac{x^3}{3} + c$

10. (*b*) $k = \frac{1}{16}$ (*c*) $x = -\frac{1}{4}$, $y = 1\frac{1}{2}$

11. (*a*) $\left(-\frac{3}{4}, 0\right)$ (*b*) $x = 0$, $y = 4$

(*c*) $(y - 3) = 3(x + 3)$ (*d*) $\sqrt{160}$

6663 Core Mathematics C1 – June 2013 (R)

1. 31

2. $2\sqrt{3}$

3. $x^3 + \frac{4}{x} + c$

4. (a) –2 (*b*) $y = \frac{1}{2}x + 4$

5. (*a*) $y = 3$ (*b*) $x = \frac{1}{3}$

6. (*a*) $x_2 = 1 - k$ (*c*) $k = \frac{3}{2}$ (*d*) 25

7. (*a*) £2300 (*c*) 24 years

8. (*b*)(i) $x(x + 4) < 21$ (*b*)(ii) $-7 < x < 3$ (*c*) $2.8 < x < 3$

9. (*a*) $x^3 - 3x^2 + 4$

10. (*a*) $f(x) = \frac{2}{3}x^{\frac{3}{2}} + 18x^{\frac{1}{2}} - 72$ (*b*) $x = 81$, $x = 1$

11. (*a*) $A(1, 3)$, $B\left(-\frac{19}{5}, -\frac{9}{5}\right)$ (*b*) $\frac{24}{5}\sqrt{2}$