C2 Numerical Answers

January 2005

1. $243 + 810x + 1080x^2$

2. (*a*) (9, 5) (*b*) $(x - 9)^2 + (y - 5)^2 = 52$

3. (*a*) $x = 1.46$ (*b*) $x = 0.5$

4. (*b*) $x = 270$

5. (*a*) $a = -10$, $b = 21$

6. (*a*) 0.9 (*b*) 8 (*c*) 79.588 (*d*) 0.412

7. (*a*) 5.6 cm (*b*) 15.7 cm (*c*) 5.95 cm^2

8. (*a*) $x = -5$ or 2; $y = 5$ or 26 (*b*) $57\frac{1}{6}$

9. (*b*) $\frac{80}{4+\pi}$ (*d*) 448 m^2

June 2005

1. $x = 3$, $y = -18$

2. (*a*) 1.29 (*b*) $\frac{1}{6}$

3. (*b*) $(x + 4)(2x - 1)(x - 3)$

4. (*a*) $1 + 12px + \frac{12\times11}{2}(px)^2$ (*b*) $p = -2$, $q = 24$

5. (*a*) $x = 50, 110$ (*b*) $x = 77.1, 102.9$

6. (*a*) 1.600, 3.200, 3.394 (*b*) 43.86 (*c*) 5260 m^3

7. (*a*) 0.548 (*b*) 0.58, 2.56

8. (*a*) (5, 0) (*b*) 4 (*c*) (1, 0), (9, 0) (*d*) $y = -\frac{2}{7}(x - 5)$

9. (*b*) 39 400 (*c*) 1 042 000

10. (*a*) 6.75

January 2006

1. (*a*) $c = 2$ (*b*) $(2x - 1)(x + 2)$ (*c*) 3.5

2. (*a*) $1 + 9px + \frac{9}{2}(px)^2$ (*b*) $p = 4$; $q = 576$

3. (*a*) $\sqrt{26}$ (*b*) $\left(\frac{7}{2}, \frac{5}{2}\right)$ (*c*) $(x - 3.5)^2 + (y - 2.5)^2 = 6.5$

4. (*b*) 9.49 (*c*) 415.9277… (*d*) 4

5. (*b*) 1.287 (*c*) 16.087 (d) 4.1

6. (*a*) $t = 15$, $v = 3.80$; $t = 25$, $v = 9.72$; $t = 30$, $v = 15.37$ (*b*) 154

7. (*a*) $6x^2 - 10x - 4$ (*b*) (2, −10) and $(-\frac{1}{3}, 2\frac{19}{27})$

(*c*) $12x - 10$ (*d*) (2, −10) is a min; $(-\frac{1}{3}, 2\frac{19}{27})$ is a max

8. (*a*) $\theta = 6.9, 113.1$ (*b*) 243.4 or 296.6

9. (*a*) $\frac{1}{2}, \frac{3}{2}$ (*b*) $\frac{1}{3}$

10. (*a*) 6.75

June 2006

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January 2007

1. (*a*) $f''(x) = 6x + 6$ (*b*) $15\frac{3}{4}$

2. (*a*) $1 - 10x + 40x^2 - 80x^3 + ...$

3. $(x - 1)^2 + (y - 5)^2 = 5$

4. $x = 1.76$

5. (*b*) $(x + 2)(x + 3)(x - 1)$ (*c*) $-3,\ -2,\ 1$

6. $x = \frac{\pi}{6},\ \frac{5\pi}{6}$

7. $\frac{7}{2}$

8. (*a*) $v = 70$ (*b*) $\frac{d^2C}{dv^2} = 2800v^{-3}$ (*c*) £40

9. (*a*) $\frac{2\pi}{3}$ (*c*) $9\sqrt{3}$ m^2 (*d*) 22.1 m^2 (*e*) 24.6 m

10. (*b*) 204 600 (*c*) 1.25 (*d*) $-1 < r < 1$ or $|r| < 1$

June 2007

1. $-2 + 4\sqrt{2}$

2. (*a*) -16 (*b*) $(x + 2)(3x - 2)(x - 3)$

3. (*a*) $1 + 6kx + \frac{6\times5}{2}(kx)^2 + \frac{6\times5\times4}{3\times2}(kx)^3$

(*b*) $\frac{2}{5}$ (*c*) $\frac{32}{25}$

4. (*b*) $\frac{1}{4}\sqrt{7}$

5. (*a*) 1.414, 3.137 (*b*) 4.04 (*c*) 1.96

6. (*a*) -0.107 (*b*) $x = 21$

7. (*a*) $3y = -2x + 9$ (*c*) $(x - 6)^2 + (y + 1)^2 = 26$

8. (*a*) $50000r^{n-1}$ (*c*) 2023 (*d*) £760000

9. (*b*) $\left(0, \frac{1}{2}\right), \left(\frac{5\pi}{6}, 0\right), \left(\frac{11\pi}{6}, 0\right)$ (*c*) 0.18, 1.91

10. (*b*) 943 cm^3

January 2008

1. (a) (i) 5, (ii) 0 (*b*) $x = 2, -2$

2. (*a*) $r = 2$ (*b*) $a = 1\frac{1}{4}$ (*c*) 1 310 719

3. (*a*) $1 + 5x + 11.25x^2 + 15x^3$ (*b*) 1.05114

4. (*b*) 230.8°, 309.2°

5. $a = 3\sqrt{3},\ b = \sqrt{3}$

6. (*a*) 253 m (*b*) $\theta = 45.8°$

7. (*c*) $10\frac{2}{3}$

8. (*a*) $(x - 6)^2 + (y - 4)^2 = 3^2$ (*c*) 3.507

9. (*b*) $\frac{300}{x} + 2x^2$ (*d*) 106.7

June 2008

1. (*b*) $(2x - 1)(x - 5)$

2. (*a*) 1.732, 2.058, 5.196 (*b*) 5.899

3. (*a*) $1 + 10ax + 45(ax)^2 + 120(ax)^3$ **+ ...** (*b*) $a = 0.75$

4. (*a*) 1.21 (*b*) $x = 1$

5. (*a*) $(x-3)^2 + (y-1)^2 = 29$ (*b*) $5x + 2y - 46 = 0$

6. (*a*) 0.072 (*b*) 25 (*d*) 28

7. (*a*) 5.6 (*b*) 19.6 cm^2 (*c*) 14.3 cm (*d*) = 10.8 cm^2

8. (*b*) $12\frac{2}{3}$

9. (*a*) 65°, 155° (*b*) 40°, 80°, 160°, 200°, 280°, 320°

January 2009

1. $243 - 810x + 1080x^2$

2. $\frac{125}{6}$ or $20\frac{5}{6}$

3. (*a*) 3.84, 4.14, 4.58 (*b*) 7.852

4. $x = \frac{4}{5}$

5. (*b*) $m_1 m_2 = -1$

6. (*a*) $a = -20$ (*b*) $b = -6$

7. (*a*) 39.6 (*b*) 2.04 (*c*) 61

8. (*b*) 284.5, 435.5, 644.5

9. (*c*) $\frac{3}{4}$ or 0.75 (*d*) 64

10. (*a*) 1737

June 2009

1. (*a*) 29

2. (*a*) $128 + 448kx + 672k^2x^2$ (*b*) $k = 4$

3. (*a*) –8 (*b*) 1 (*c*) $(3x - 5)(x + 2)$

4. (*a*) $x = 2$ gives 2.236; $x = 2.5$ gives 2.580 (*b*) 6.133

5. (*b*) 729 (*c*) 2182 (*d*) 2187

6. (*a*) Centre is (3, –2); $r = 5$ (*c*) (0, 2)

7. (i) $\theta = 23.6, 156.4$ (ii) $x = 41.4, 318.6$

8. (*a*) $y = \frac{1}{8}$ or 0.125 (*b*) $x = \frac{1}{8}$

9. (*b*) $\sqrt[3]{900}$, or 9.7 (*d*) 279.65

January 2010

1. $729 - 1458x + 1215x^2$

2. $x = 30, 150$

3. (*a*) $a = 5,\ b = -1$ (*b*) $(x + 2)(2x + 3)(x - 1)$

4. (*b*) 20.9 cm^2

5. (*a*) $x = 8$ (*b*) $x = \frac{3}{2}$

6. (*b*) $n = 13$ (*c*) £314.70 (*d*) 7455.94

7. (*a*) (1, 0), (4, 0) (*c*) $\frac{1}{3}x - \frac{5}{2}x^2 + 4x\ (+c)$ (*d*) $6\frac{1}{6}$

8. (*a*) (2, –1) (*b*) 6.5 (*c*) *A* (-4, –3.5), *B* (8, –3.5) (*e*) 15.6

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

June 2010

1. (*a*) 2.35, 3.13, 4.01 (*b*) 2.828

2. (*a*) –98 (*b*) $\frac{2}{3}$, –4, 5

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

4. (*a*) $1 + 7ax + 21a^2x^2 + 35a^3x^3$ (*b*) 6.133

5. (*a*) $\tan\theta = 0.4$ (*b*) $x = 10.9°, 100.9°, 190.9°, 280.9°$

6. (*a*) 6.3 (*b*) 28.35 (*c*) 7.58 (*d*) 5.76

7. (*b*) $x = 8$

8. (*b*) $14\frac{2}{3}$

9. (*b*) $r = 1.03$ (*d*) $N = 17$ (*e*) 287 000

10. (*a*) $(x - 2)^2 + (y - 1)^2 = 100$ (*b*) $y - 7 = -\frac{4}{3}(x - 10)$

(*c*) $10\sqrt{3}$

January 2011

1. (*b*) $a = 9,\ b = -6$

2. (*a*) 1.64 (*b*) 27.9 cm^2

3. (*a*) $-\frac{1}{5}$ (*b*) –3750 (*c*) –3125

4. (*a*) 1 and 5 (*b*) 36

5. (*a*) 36 (*b*) 7.2

6. (*a*) 0.30, 0.24 (*b*) 0.3175 (*c*) 0.2175

7. (*b*) 228.6, 270, 311.4

8. (*b*) $x = 0,\ x = 0.56$

9. (*b*) $(x-3)^2 + (y-6)^2 = 50$ (*d*) $y = -7x + 77$

10. (*a*) $100 - 80x + 12x^2$ (*b*) $74\frac{2}{27}$

June 2011

1. (*a*) –6 (*c*) $(x+1)(2x-1)(x-4)$

2. (*a*) $243 + 405bx + 270b^2x^2 + \ldots$ (*b*) $b = 3$

3. (*a*) 1.43 (*b*) $2\frac{1}{3}$

4. (*a*) (–2, 1) (*b*) $r = 4$ (*c*) $(0, 1 \pm 2\sqrt{3})$

5. (*a*) 18.8 cm^2 (*b*) $r = 2$ (*c*) 2π cm^2

6. (*a*) $r = 0.75$ (*b*) 256 (*c*) 1024 (*d*) $n = 14$

7. (*a*) 93.2°, 356.8° (*b*) $\frac{\pi}{3},\ \frac{5\pi}{3}$

8. (*b*) 54 cm

9. (*a*) (–4, 0), (5, 9) (*b*) $R = 121.5$

January 2012

1. (*a*) 28.5 (*b*) 2680 (*c*) 2880

2. $(x+1)^2 + (y-7)^2 = 50$

3. (*a*) $1 + 2x + \frac{7}{4}x^2 + \frac{7}{8}x^3$ (*b*) 1.2184

4. (*b*) $x = \frac{1}{3}$ or $x = 9$

5. (*b*) $a = 2,\ b = -2$

6. (*a*) 4, 2.31 (*b*) 11.88 (*c*) $11\frac{1}{4}$

7. (*a*) 5.7 cm (*b*) 17.1 cm^2 (*d*) 11.7 cm (*e*) 4.5 cm^2

8. (*c*) 8 m (*d*) 21 cm

9. (i) $x = 55, 135, 175$ (*b*) $a = 2,\ b = \frac{\pi}{5}$

June 2012

1. $32 - 240x + 720x^2$

2. $x = 3,\ x = 6$

3. (*a*) (10, 8) (*c*) $y = 4,\ y = 12$ (*d*) 19.3

4. (*b*) $(x+2)(2x-3)(x-4)$

5. (*a*) $A(2, 8),\ B(9, 1)$ (*b*) $57\frac{1}{6}$

6. $x = 39.2, 140.8$

7. (*a*) 1.494, 1.741 (*b*) 1.4965

8. (*a*) $h = \frac{60}{\pi x^2}$ (*c*) $x = \sqrt[3]{\frac{120}{4\pi}} \approx 2.12$ (*d*) 85

9. (*b*) $r = 0.6$ (*c*) $a = 15$ (*d*) $S_\infty = 37.5$

January 2013

1. $64 - 960x + 6000x^2$

2. (*b*) $a = 2,\ b = 5$

3. (*a*) $120\,000 \times (1.05)^3 = £138\,915$ (*b*) 2024 (*c*) £1 704 814

4. $x = 41.2°, 85.5°$ and $161.2°$

5. (*a*) (i) M (10, 12) (ii) $r = 7$
(*b*) $MN = 25$ units (*c*) $NP = 24$ units

6. (*b*) $x = 25$ or $x = 9$

7. (*b*) 32.5 cm^2 (*c*) 42.1 cm^2 (*d*) 27.2 cm

8. (*b*) $x = -\sqrt{2}$ (*c*) $-48x^{-5}$
(*d*) Maximum at P, Minimum at Q

9. (*a*) 6.272, 3.634 (*b*) $R = 11.42$ units^2 (*c*) $R = 12$ units^2

June 2013

1. (*a*) $\frac{2}{3}$ (*b*) 8 (*c*) 53.877

2. (*a*) $16 + 96x + 216x^2 + 216x^3 + 81x^4$
(*b*) $16 - 96x + 216x^2 - 216x^3 + 81x^4$

3. (*b*) $f(x) = (x - 3)(2x - 3)(x + 2)$ (*c*) $y = 0.37$

4. (*a*) $y = 1.538$ (*b*) 6.24 (*c*) 18.24

5. (*a*) 262.5 m^2 (*b*) 80.2 m

6. (*a*) –4 and 2 (*b*) $49\frac{1}{3}$

7. (i) $x = \frac{4}{11}$ (ii) $y = \frac{1}{8}a^5$

8. (i) –83.7 (ii)(*b*) $\theta = 72, 144, 216, 288$

9. (*a*) $x = 4$, y = –28 (*b*) y is a minimum

10. (*a*) $(x + 5)^2 + (y - 9)^2 = 25$ (*b*) PT = 20

June 2013 (R)

1. $x = 2, y = 9$

2. (*a*) 0.8572 (*b*) 0.416

3. $256 - 512x + 448x^2 - 224x^3$

4. (*a*) $a = 6, b = -4$ (*b*) $f(x) = (3x + 2)(x - 2)(2x - 1)$

5. (*c*) $r = \frac{3}{2}$ (*d*) $S_{10} = 2267$

6. (*a*) $2 + a$ (*b*) $5a - 4$ (*c*) $x = 2.498$

7. (*a*) $x = -4, x = 2$ (*b*) $R = 36$

8. (*b*) 670 g

9. (i) $\theta = 123.4°, 176.6°$ (ii) $x = 70.5°, 289.5°$