KEY

Section 1: Algebra

1.1 $4A - 4I$
1.2 7
1.3 12
1.4 $-a_1 + 9a_2 + 5a_3 \neq 0$
1.5 $x^4 - 16x^2 + 4$
1.6 $G_y = gG_xg^{-1}$
1.7 01
1.8 ± 1
1.9 $\dim(V_0) = 2n;\ \dim(V_e \cap V_0) = n$
1.10 $x = aqm + bpn = aqm + p(1 - am)$ etc.
1.11 $\overline{13}$
1.12 3
1.13 b
1.14 $\binom{23}{3} = \frac{23!}{20!3!} = 21.22.23/1.2.3 = 7 \times 11 \times 23 = 1771$
1.15 c

Section 2: Analysis

2.1 $e^{-\frac{1}{6}}$
2.2 $\frac{\pi}{4}$
2.3 (a) $\delta \leq 2\varepsilon$; (c) $\delta \leq \varepsilon$
2.4 a,b,c
2.5 $\frac{1.3.5}{2.4.6}\frac{1}{7}$
2.6 $f \equiv 0$
2.7 b,c
2.8 $4 \leq x < 6$
2.9 $\frac{1}{\sqrt{2}}\log(\sqrt{2}+1)$
2.10 Minimum at (3,-1); Min. value = -8
(can accept either answer)
2.11 $(\pm 1, \frac{1}{2})$; shortest distance $= \frac{\sqrt{5}}{2}$
2.12 $\int_0^1 \int_y^1 f(x,y)\,dx\,dy = \int_0^1 \int_0^x f(x,y)\,dy\,dx$
2.13 $1 + \omega + \omega^2 + \omega^3 + \omega^4 + \omega^5 + \omega^6 = 0$
2.14 b
2.15 $\frac{\pi i}{4}$

Section 3: Geometry

3.1 $x^2 + y = 2$
3.2 $r = s = t = 0$
3.3 none
3.4 $\sqrt{5}(x^2 + y^2) - 20x + 10y = 0; \sqrt{5}(x^2 + y^2) + 20x - 10y = 0$
3.5 c
3.6 a
3.7 $x^2 + y^2 + 2py = 0$
3.8 $b\sin\theta x + (a - b\cos\theta)y = ab\sin\theta$
3.9 a pair of straight lines
3.10 $(-1, 1)$
3.11 centre $= (1, -2)$; radius $= 2$
3.12 $\frac{\sqrt{2}}{3}$
3.13 (a) strictly convex; (b) convex, but not strictly convex;(c)not convex
3.14 $\{(x,y) \mid x \geq 1; 1 - x \leq y \leq x - 1\}$
3.15 b