KEY

Section 1: Algebra

1.1 a,c
1.2 (1 8 7)(3 5 4)
1.3 (1 2)(3 4), (1 3)(2 4) and (1 4)(2 3)
1.4 a,b,c
1.5 a,b
1.6 Any two linearly independent matrices with trace zero and the entries of the first row adding up to zero
1.7 $(n-1)^2$
1.8

$$\begin{bmatrix} 5 & 0 & 0 & 0 \\ 0 & 2 & 3 & 0 \\ 0 & 3 & 2 & 0 \\ 0 & 0 & 0 & 5 \end{bmatrix}$$

1.9 $\pm\sqrt{3}$
1.10 $0, -3i$

Section 2: Analysis

2.1 2
2.2 a,b
2.3 $k\pi, k \in \mathbb{Z}$

2.4 $e^{\frac{af'(a)}{f(a)}}$
2.5 b,c
2.6 a,b,c
2.7 $\frac{9}{16}$
2.8 $h = 2r$
2.9

$$\sum_{n=1}^{\infty}(-1)^{n-1}\frac{x^{2n}}{2n}$$

2.10 $\frac{1}{2}\left(a + \frac{1}{a}\right)$

Section 3: Geometry

3.1 $(1, 2)$
3.2 $\frac{\pi}{2}$
3.3 $(1, 1)$
3.4 $a = \frac{l}{2},\ b = \frac{\sqrt{l^2-d^2}}{2}$
3.5 b,c
3.6 $|\det(A)|a$
3.7 2π
3.8 $x^2 + y^2 + z^2 - ax - by - cz = 0$
3.9 $a(x-a) + b(y-b) + c(z-c) = 0$
3.10 $2\sqrt{2}$

Note: 1. Please accept any answer which is correct, but expressed in an equivalent, though different, form, where applicable.
2. In Question 1.3, if (1 2)(3 4) is omitted, it may be excused.