Section 1: Algebra

1.1 $1, 1, \frac{1 \pm i\sqrt{3}}{2}$

1.2 a,c

1.3 one

1.4 a,b

1.5 1,2

1.6
$$\begin{bmatrix} 0 & 0 & 0 & 6 & 0 \\ 0 & 0 & 0 & 0 & 24 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

1.7 Any three linearly independent 2×2 matrices with trace zero. Example:
$$\begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix}, \begin{bmatrix} 0 & 0 \\ 1 & 0 \end{bmatrix}, \begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix}$$

1.8 $\mathbb{R}$

1.9 Any 2×2 matrix with trace -1 and determinant 1.

1.10 a,b,c

Section 2: Analysis

2.1 a,b,c

2.2 $\frac{1}{3}\log 2$

2.3 $\mathbb{R} \backslash \{-1\}$

2.4 a,b,c

2.5 uniformly on $[0,1]^*$

2.6 a,c

2.7 $\frac{2}{3}$

2.8 a,b

2.9 a,b

2.10 $\pm \frac{\sqrt{3}+i}{\sqrt{2}}$

Section 3: Topology

3.1 c

3.2 a,b,c

3.3 a,c

3.4 a,b,c

3.5 a,c

3.6 b

3.7 b

3.8 a,b

3.9 a,b,c

3.10 a

Section 4: Applied Mathematics

4.1 3

4.2 $h = 2r$

4.3 $\mathrm{div}(\mathbf{u}) = 0$

4.4 $Mx'' + cx' + kx = 0; x(0) = x_0; x'(0) = 0$, where k and c are positive constants

4.5 $\max z = 17; x = 2; y = 1$

4.6 $\min f = u - 2v + 4w$ such that $u - 2v + w \geq 5; -u - v + 2w \geq 7; u, v, w \geq 0$

4.7 $x(t) = c_1 e^{2t} + c_2 e^{-3t}; \ y(t) = c_1 e^{2t} - 4c_2 e^{-3t}$

4.8 $(\mathbf{a}.\mathbf{c})\mathbf{b} - (\mathbf{a}.\mathbf{b})\mathbf{c}$

4.9 $u(x,y) = y(x^3 - 3x + 1)$

4.10 8

Section 5: Miscellaneous

5.1 a,b,c

5.2 $\frac{1}{4}$

5.3 a. countable; b. uncountable; c. countable

5.4 $\sqrt{14}$

5.5 $n + 1$

5.6 one

5.7 $\frac{N}{2}\phi(N)$

5.8 b,c

5.9 $4n2^{n-1} - 2^n + 1$

5.10 $1 - \frac{1}{2}5^{\frac{1}{3}}$

Note:
Accept any correct equivalent form of the answers.
* Qn. 2.5: Accept even if the answer is just 'uniformly'