Section 1: Algebra

1.1 a.
1.2 all.
1.3 $\pm 1, \pm i$.
1.4 1,2.
1.5 e.g. $x^3 + 2x + 1$.
(any polynomial of degree 3, for which 0,1 and 2 are not roots (mod 3)).
1.6 (a) n; (b) 0.
1.7 a,c.
1.8 b,c.
1.9 a,c.
1.10 a,c.

Section 2: Analysis

2.1 (a) conditionally convergent; (b) divergent; (c) absolutely convergent.
2.2 $]0, 2]$.
2.3 1.
2.4 $1/\pi$.
2.5 a,c.
2.6 a.
2.7 all.
2.8 $8\pi i$.
2.9 a,b.
2.10 none.

Section 3: Topology

3.1 a,b.
3.2 b,c.
3.3 c.
3.4 c.
3.5 b.
3.6 a,c.
3.7 c.
3.8 Yes; uncountable.
3.9 Yes.
3.10 Yes; 1.

Section 4: Applied Mathematics

4.1 $\frac{4}{3}\pi a^3$.
4.2 div $u = 0$.
4.3 0.
4.4 π^2.
4.5

$$\frac{1}{2}\ell^2 \left(\frac{d\theta}{dt}\right)^2 \;=\; g\ell(\cos\theta - \cos\alpha)$$

4.6 $u(x,t) = x^2 + t^2$.
4.7 $\min z = 4$ at the point $(8/7, 4/7)$. (Either data can be accepted as full answer).
4.8 a,b.
4.9 $L[f](p) = a/(a^2 + p^2)$.
4.10

$$\int_\Omega f \; dx + \int_{\partial\Omega} g \; dS \;=\; 0.$$

Section 5: Miscellaneous

5.1 $\frac{n}{2}\sin\frac{2\pi}{n}$.
5.2 $8t^4 - 8t^2 + 1$.
5.3 2/3.
5.4 4/9.
5.5 all.
5.6 01.
5.7 960.
5.8 Example: $(n+1)! + 2, \cdots, (n+1)! + (n+1)$.
5.9 5.
5.10 40.