Section 1: Algebra

1.1 a,b,c

1.2 a,c

1.3 b

1.4 $(p-1)/2$

1.5
$$\begin{bmatrix} 1 & 4 & 3 \\ 0 & 3 & 1 \\ 0 & 0 & 2 \end{bmatrix}$$

1.6
$$\begin{bmatrix} 1 & -2 & 2 & 0 \\ 0 & 1 & -4 & 6 \\ 0 & 0 & 1 & -6 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

1.7 $x^3 + 6x^2 + 18x + 24$

1.8 (a) n;   (b) 0

1.9 a

1.10 b,c

Section 2: Analysis

2.1 b,c

2.2 $2f(0)$

2.3 $3[f(1/3) - f(0)]$

2.4 (a) 0;   (b) $\frac{1}{2}\int_{-\pi}^{\pi} f(t)\,dt$

2.5 (a) Not uniformly convergent; (b) uniformly convergent; (c) not uniformly convergent

2.6
$$\frac{2}{x}\left(e^{x^2} - e^{-x^2}\right)$$

2.7
$$e^{\frac{k(k+1)}{2a}}$$

2.8
$$\frac{1}{4} + \frac{1}{4}\sum_{n=1}^{\infty}(-1)^n(n+1)\left(\frac{z-2}{2}\right)^n$$

2.9 0

2.10 b

Section 3: Topology

3.1 b,c

3.2 a,b

3.3 b,c

3.4 a,b

3.5 b

3.6 b

3.7 none

3.8 a,c

3.9 c

3.10 a,c

Section 4: Applied Mathematics

4.1 $x^2 + 2y^2 = c^2$

4.2 $-u'' = f$ on $]0,1[; u(0) = u(1) = 0$

4.3
$$\begin{aligned} x(t) &= e^t(\cos\omega t - \sin\omega t) \\ y(t) &= e^t(\cos\omega t + \sin\omega t) \end{aligned}$$

4.4 $u(x,t) = (x - bt)^2$

4.5
$$v''(r) + \frac{n-1}{r}v'(r) = 0$$

4.6
$$L[y](s) = \frac{1 + a + s}{s^2 + as + b}$$

4.7 $x_{n+1} = \frac{1}{2}(3x_n - ax_n^3)$

4.8 b,c

4.9 b

4.10 max $z = 21$ at $x = 3; y = 0$

Section 5: Miscellaneous

5.1 b,c

5.2 $\frac{N}{2}(2a + (N^2 - 1)d)$

5.3 $n! - 2(n-1)!$

5.4
$$D_n = n! - 1 - \sum_{k=1}^{n-2}\binom{n}{k}D_{n-k}$$

5.5 $44/120 = 11/30$

5.6 a,b,c

5.7 a,b,c

5.8
$$\frac{x}{1 - x - x^2}$$

5.9 semi-major axis = 1; semi-minor axis = 1/3

5.10
$$a + (b - a)e^{-\frac{1}{2}}$$

Note:
Accept any correct equivalent form of the answers.