Section 1: Algebra

1.1 $6!$

1.2 2^7

1.3 $N(H) = H$

1.4 b,c

1.5 c

1.6 Any two linearly independent elements in W. Example:

$$\begin{bmatrix} 0 & 1 & -1 \\ -1 & 0 & 0 \\ 1 & 0 & 0 \end{bmatrix}, \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 1 \\ 0 & -1 & 0 \end{bmatrix}$$

1.7 c

1.8 b,c

1.9 Any functional of the form $ax - ay + cz$, where $3c - a = 1$

1.10 a,b,c

Section 2: Analysis

2.1 a,c

2.2 a,b

2.3 b

2.4 c

2.5 a,b

2.6 b,c

2.7 b,c

2.8 a,b,c

2.9 $-\frac{2\pi i}{e}$

2.10 b,c

Section 3: Topology

3.1 a,b,c

3.2 a,c

3.3 b,c

3.4 b,c

3.5 b,c

3.6 a,c

3.7 a,b,c

3.8 a,c

3.9 a,b

3.10 a,b

Section 4: Calculus & Differential Equations

4.1 $-\frac{4}{\pi^2}$

4.2 $\frac{12\pi}{5}$

4.3 $\frac{3}{4}\sqrt{\pi}$.

4.4 $y = c_1 e^{c_2 x}$

4.5 $y'' = g - c(y')^2$ for $t > 0$; $y(0) = y'(0) = 0$.

4.6 $\sqrt{\frac{g}{c}}$

4.7 $y' = u$; $u' = v$; $v' = v - x^2 u^2$

4.8 0

4.9 3

4.10 $[-(t+1), (t+1)]$

Section 5: Miscellaneous

5.1 a. $E \cup F$; b. F

5.2 $E = \cap_{n=1}^{\infty} \cup_{m=n}^{\infty} E_m$

5.3 $2^n(2n - 1) + 1$

5.4 4320

5.5 $\frac{10}{21}$

5.6 Semi-major axis $= 1$; semi-minor axis $= \frac{1}{3}$

5.7 $\frac{1}{2}\log \frac{3}{2}$

5.8 14

5.9 a,b,c

5.10

$$\left(|a|^{\frac{3}{2}} + |b|^{\frac{3}{2}} + |c|^{\frac{3}{2}} \right)^{\frac{2}{3}}$$

Note: Please accept any correct equivalent form of the answers.