

# Corrections for the book *Set Theory: A First Course*, by Daniel W. Cunningham

## Errata for Chapter 1

1. On page 1, in line  $-7$ , replace the word “usually” with the word “sometimes”.
2. On page 3, after the last sentence above Problem 1, add the sentence:

The set  $\{x \in A : P(x)\}$  can also be written as  $\{x : x \in A \text{ and } P(x)\}$ .

3. On page 3, just prior to Definition 1.1.2, add the paragraph:

We will occasionally identify a set by the method of *comprehension*. In this method one defines a set to be the collection of all the elements  $x$  that satisfy a property  $P(x)$ . The notation  $\{x : P(x)\}$  will be used to identify this set.

4. On page 5, at the end of Section 1.1 (prior to the exercises), add the paragraph:

We employed the method of comprehension to identify the sets  $\mathcal{P}(A)$  and  $A \cup B$ ; however, one must use this method with caution. For certain (bizarre) properties  $P(x)$ , the collection  $\{x : P(x)\}$  is not a set (see Russell’s Paradox on page 20). On the other hand, Theorem 2.1.3 presents a condition under which one can correctly produce a set by the method of comprehension.

5. On page 6, in the first three numbered items, the indefinite article “a” needs to be inserted as follows:

1.  $P \wedge Q$  (means “ $P$  and  $Q$ ” and is called a *conjunction*).
2.  $P \vee Q$  (means “ $P$  or  $Q$ ” and is called a *disjunction*).
3.  $\neg P$  (means “not  $P$ ” and is called a *negation*).

6. On page 13, in Exercise 4 replace “ $(P \vee Q) \wedge R \Leftrightarrow (P \wedge R) \vee (P \wedge Q)$ ” with “ $(P \vee Q) \wedge R \Leftrightarrow (P \wedge R) \vee (Q \wedge R)$ ”.

7. On page 23, in Exercise 6 the variable “ $x$ ” appearing in the formula

$$\forall z \forall y ((\varphi(x) \wedge \varphi(y)) \rightarrow z = y)$$

should be replaced with the variable “ $z$ ” as follows:

$$\forall z \forall y ((\varphi(z) \wedge \varphi(y)) \rightarrow z = y).$$

## Errata for Chapter 2

1. On page 35, in the third line of the last paragraph before Exercises 2.1, the expression

Clearly, the set  $X = \{1, 3\}$  is subset of  $A \cup B, \dots$

is missing the indefinite article “a” which needs to be inserted as follows:

Clearly, the set  $X = \{1, 3\}$  is a subset of  $A \cup B, \dots$

2. On page 35, in item 1 of Exercises 2.1, delete “If  $A \subseteq B$ , then”.
3. On page 36, delete item 15 of Exercises 2.1 (remove duplicate exercise).
4. On page 36, in item 24 of Exercises 2.1, replace “Let  $A$  be a set.” with “Let  $A$  and  $B$  be sets.”
5. On page 40, delete item 7 of Exercises 2.2 (remove duplicate exercise).

## Errata for Chapter 3

1. On page 55, in item 13 of Exercises 3.2 replace  $R \circ R^{-1}$  with  $R \cap R^{-1}$ .
2. On page 57, in the 5th line from the bottom, replace “ $\langle b, 7 \rangle \in g$  and  $\langle b, 8 \rangle \in g$ ” with “ $\langle b, 7 \rangle \in G$  and  $\langle b, 8 \rangle \in G$ ”.
3. On page 67, in the 2nd to last line of the proof of Theorem 3.3.24, replace “ $H: C \rightarrow C$ ” with “ $H: C \rightarrow \bigcup C$ ”.

## Errata for Chapter 4

1. On page 100, replace the last line of the proof of Theorem 4.3.11 with  
“Hence,  $m \cdot (n + p^+) = m \cdot n + m \cdot p^+$ , and thus,  $p^+ \in I$ .”
2. On page 107, in the 2nd line from the bottom, replace “ $m \subseteq m$ ” with “ $m \in m$ ”.

## Errata for Chapter 5

1. On page 118, in the fourth line after equation (5.4), replace " $2 \cdot f(x) = 2 \cdot g(x) + 1$ " with " $2 \cdot f(x) = 2 \cdot g(y) + 1$ ".
2. On page 120, in the third to the last line of the proof of Theorem 5.2.9, replace " $p(i, f_i(x)) = p(j, f_j(x))$ " with " $p(i, f_i(x)) = p(j, f_j(y))$ ".
3. On page 122, in the first line, the expression "Let  $F_A$  be set of all finite subsets of  $A$ . Define" should be "Let  $F_A$  be the set of all finite subsets of  $A$  and define".
4. On page 130, in the fourth line of the proof of Theorem 5.4.5, replace " $Y \in \mathcal{P}(A)$ " with " $Y \in \mathcal{P}(B)$ ".
5. On page 136, in the fourth line of the proof of Claim 2, replace " $y \in A$ " with " $y \in X$ ".

## Errata for Chapter 6

1. On page 149, on the second line, replace "Theorem 6.2.5" with "Theorem 6.2.1".

## Errata for Chapter 7

1. On page 164, in Exercise 6(b) replace " $(f \upharpoonright M): X \rightarrow B$ " with " $(f \upharpoonright M): M \rightarrow B$ ".
2. On page 170, in Exercise 7 replace "Prove Lemma 7.2.4(2)" with "Prove Lemma 7.2.4(1)".
3. On page 170, in Exercise 8 replace "Prove Lemma 7.2.4(3)" with "Prove Lemma 7.2.4(2)".
4. On page 170, add an asterisk to Exercise 9.
5. On page 171, in Exercise 17 replace "Suppose that  $\preccurlyeq$  is a total preorder on  $A$ " with "Suppose that  $\preccurlyeq$  is a total preorder on  $B$ ".
6. On page 173, the last line of the proof of Theorem 7.3.1 states "Hence,  $X = A$  and  $\preccurlyeq$  is a well-ordering on  $A$ ." After this last line, unfortunately, there is no end of proof symbol  $\square$ .

## Errata for Chapter 8

1. On page 178, in the 2nd and 3rd lines, the statements "Hence,  $x \preccurlyeq y$ . Thus, by Claim 3,  $H(x) \subseteq H(y)$ " should be "Hence,  $x \preccurlyeq z$ . Thus, by Claim 3,  $H(x) \subseteq H(z)$ ".

## Errata for Chapter 9

1. On page 213, in Theorem 9.1.11 the expression " $\aleph_\alpha \in \aleph_\alpha$ " should be " $\aleph_\alpha \in \aleph_\beta$ ".
2. On page 217, add an asterisk to Exercise 15.
3. On page 222, in the first line of the proof of Lemma 9.2.11 replace "Lemma 9.2.7" with "Theorem 9.2.8".

Thank you Professor Kevin Easley (Truman State University), Alexander Chekalin, Humberto Ojeda, Lluís Maestre Coral, Sherman Page, and Larry Lawson for contributing to this errata sheet.

Dear Reader, please notify me about other errors that you may find, at [cunnindw@buffalostate.edu](mailto:cunnindw@buffalostate.edu)