

Rosen, Discrete Mathematics and Its Applications, 7th edition  
Extra Examples  
Section 9.4—Closures of Relations



— Page references correspond to locations of Extra Examples icons in the textbook.

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**p.598, icon at Example 2**

#1. Let  $R$  be the relation on  $\{1, 2, 3, 4\}$  such that

$$R = \{(1, 1), (1, 4), (2, 3), (3, 1), (3, 3), (4, 4)\}.$$

Find:

- (a) the reflexive closure of  $R$ .
- (b) the symmetric closure of  $R$ .
- (c) the transitive closure of  $R$ .

**Solution:**

- (a)  $\{(1, 1), (1, 4), (2, 2), (2, 3), (3, 1), (3, 3), (4, 4)\}$ .
  - (b)  $\{(1, 1), (1, 3), (1, 4), (2, 3), (3, 1), (3, 2), (3, 3), (4, 1), (4, 4)\}$ .
  - (c)  $\{(1, 1), (1, 4), (2, 1), (2, 3), (2, 4), (3, 1), (3, 3), (3, 4), (4, 4)\}$ .
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