

**Exercises 2.5**

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Some of the arguments in Exercises 1–5 are valid by universal modus ponens or modus tollens; others are invalid. State which are valid and which are invalid.

- ① All healthy people eat an apple a day.  
Johnny is not a healthy person.  
 $\therefore$  Johnny does not eat an apple a day.
  - ② All healthy people eat an apple a day.  
Johnny eats an apple a day.  
 $\therefore$  Johnny is a healthy person.
  - ③ All freshmen must take writing.  
Dan is a freshman.  
 $\therefore$  Dan must take writing.
  4. All natural numbers are integers.  
 $\pi$  is not an integer.  
 $\therefore$   $\pi$  is not a natural number.
  5. All integers are natural numbers.  
 $-5$  is an integer.  
 $\therefore$   $-5$  is a natural number.
  6. How is it possible for a valid argument to have a false conclusion?
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