This miniproject asks you to start thinking in terms of formal proofs and be able to spot errors in formal proofs.

Do the following problems.

- (a) Give a formal proof for the Lewis Carroll argument in Example 26 of Section 1.3.
- (b) Give a formal proof for the Lewis Carroll argument in Example 27 of Section 1.3.
- (c) Find and explain all error(s) in the formal "proof" below, that attempts to show that if $\exists x A(x) \land \exists x B(x)$ is true, then $\exists x (A(x) \land B(x))$ is also true (which is not true).

	Step	Reason
(1)	$\exists x A(x) \land \exists x Q(x)$	premise
(2)	$\exists x A(x)$	simplification of (1)
(3)	A(c)	existential instantiation from (2)
(4)	$\exists x B(x)$	simplification of (1)
(5)	B(c)	existential instantiation from (4)
(6)	$A(c) \wedge B(c)$	conjunction from (3) and (5)
(7)	$\exists x \left(A(x) \land B(x) \right)$	existential generalization

(d) Find and explain all error(s) in the formal "proof" below, that attempts to show that if $\forall x (A(x) \lor B(x))$ is true, then $\forall x A(x) \lor \forall x B(x)$ is also true (which is not true).

	Step	Reason
(1)	$\forall x \left(A(x) \lor B(x) \right)$	premise
(2)	$A(c) \lor B(c)$	universal instantiation from (1)
(3)	A(c)	simplification from (2)
(4)	B(c)	simplification from (2)
(5)	$\forall x A(x)$	universal generalization from (3)
(6)	$\forall x B(x)$	universal generalization from (4)
(7)	$\forall x A(x) \lor \forall x B(x)$	conjunction from (5) and (6)

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