

# Math 2283 - Introduction to Logic

Quiz #1 - 2013.08.21

Solutions

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If  $x$  and  $y$  are real numbers, consider the following:

- (a) For any  $x$  and  $y$ ,  $x < y^2$ .
- (b) For each  $x$  there is a  $y$  such that  $x < y^2$ .
- (c) There is a  $y$  such that  $x < y^2$ .
- (d) For any  $x$ ,  $x < y^2$ .
- (e)  $x < y^2$ .

1. Which of the above are sentential functions, and which are sentences?

- (a) and (b) are sentences.

2. For each of (a)-(e), state which quantifiers, if any, are used with each variable.

- (a) - universal quantifier with  $x$  and  $y$  both.
- (b) - universal with  $x$  and existential with  $y$ .
- (c) - none for  $x$ , existential with  $y$
- (d) - universal with  $x$ , none for  $y$
- (e) - none

3. For each of (a)-(e) which are sentences, state whether the sentence is true or false.

- (a) - is false, a simple counterexample is  $x = 1$  and  $y = 0$ .
- (b) - is true, for a given  $x$ , we can find a  $y$  such that  $y^2 > x$