163 Quiz Name: _____

Write the following statements in English, and negate each statment (in English). Determine whether the original statement is true, and give a justification. The domain of each statement is $\mathbb{Z} = \{..., -2, -1, 0, 1, 2, ...\}$

Here is an example:

1. $\exists x \forall y(xy = 0)$
   (a) English: There exists an integer x such that for all integers y we have $xy = 0$
   (b) Negation: For all integers x there exists some integer y such that $xy \neq 0$
   (c) True or False
   (d) Let $x = 0$
2. $\forall x \exists y(y = x^2)$
   (a) English
   (b) Negation
   (c) True or False
   (d) Justification
3. $\forall y \exists x(y = x^2)$
   (a) English
   (b) Negation
   (c) True or False
   (d) Justification

4. $\exists x \exists y(x + y = -2)$

   (a) English

   (b) Negation

   (c) True or False

   (d) Justification

5. $\forall x \forall y([(x < 0) \wedge (y < 0)] \rightarrow (xy > 0))$

   (a) English

   (b) Negation hint: $\neg(p \rightarrow q) \equiv (p \wedge \neg q)$

   (c) True or False

   (d) Justification