1.(1 pt)

Let P(x) be the statement " the word x contains the letter 'a' ". What are the truth values of the following?

__ 1. P(lemon)
__ 2. P(orange)
__ 3. P(false)
__ 4. P(true)

2.(1 pt)

Determine the truth value of the following statements if the universe of discourse of each variable is the set of real numbers.

__ 1. $\exists x \exists y(x+y \neq y+x)$
__ 2. $\forall x \exists y((x+y=2) \wedge (2x-y=1))$
__ 3. $\forall x \exists y(x+y=1)$
__ 4. $\exists x \forall y(xy=0)$
__ 5. $\forall x \exists y(x=y^2)$
__ 6. $\forall x \neq 0 \exists y(xy=1)$
__ 7. $\exists x \exists y((x+2y=2) \wedge (2x+4y=5))$
__ 8. $\exists x(x^2=-1)$
__ 9. $\exists x(x^2=2)$
__ 10. $\forall x \exists y(x^2=y)$
__ 11. $\forall x \forall y \exists z(z=\frac{x+y}{2})$
__ 12. $\exists x \forall y \neq 0(xy=1)$

3.(1 pt)

The notation

$\exists! x P(x)$

denotes the proposition

" There exists a unique x such that P(x) is true. "

If the universe of discourse is the set of integers, what are the truth values of the following?

__ 1. $\exists! x(x>1)$
__ 2. $\exists! x(x^2=1)$
__ 3. $\exists! x(x+3=2x)$
__ 4. $\exists! x(x=x+1)$