CS 173 (B), Spring 2015, Examlet 1, Part B

NAME:	NETID:

Discussion Section: BDA:1PM BDB:2PM BDC:3PM BDD:4PM BDE:5PM

1. Check the (single) box that best characterizes each item. [6 points]

   $\forall x \in \mathbb{R}, (|x+5| \leq 5) \rightarrow (|x| \leq 100)$. true ☑ false ☐ undefined ☐

   $\neg(p \wedge \neg q) \equiv \neg p \wedge q$ true ☐ false ☑

   $\neg(\forall x\ P(x) \rightarrow Q(x))$
   $\equiv \exists x\ \neg P(x) \wedge Q(x)$ true ☐ false ☑

2. **Predicates** [12 points]

   Suppose three predicates, C, D and O (standing for being a cat, a dog, or the name of an operating system) are defined over the universe {Lion, Wolf, Fox, Puma, Jaguar}, as follows (T denotes True and F denotes False).

x	$C(x)$	$D(x)$	$O(x)$
Lion	T	F	T
Wolf	F	T	F
Fox	F	T	F
Puma	T	F	F
Jaguar	T	F	T

   Select all the statements below that are true. (No justification is needed.)

☑ A. $\forall x\ O(x) \rightarrow C(x)$. Since C(Lion) and C(Jaguar).

☐ B. $\exists x\ \neg(O(x) \rightarrow C(x))$. This is the negation of A.

☑ C. $\exists x\ D(x) \rightarrow O(x)$. consider x s.t. $\neg D(x)$: say $x =$ Lion.

☑ D. $\forall x\ \neg(C(x) \wedge D(x))$. C and D are never simultaneously true.

3. Which of the following propositions is equivalent to the proposition p? [2 points]

☑ A. $\neg p \rightarrow F$ (where F stands for false)

☐ B. $p \rightarrow \neg p$

☐ C. $p \rightarrow F$

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1. Check the (single) box that best characterizes each item. [6 points]

$\exists x \in \mathbb{R}, (|x+5| \leq 5) \wedge (|x| > 15)$. true ☐ false ☑ undefined ☐

$\neg(p \wedge \neg q) \equiv \neg p \wedge q$ true ☐ false ☑

$\neg(\forall x\ P(x) \rightarrow Q(x)) \equiv \exists x\ P(x) \wedge \neg Q(x)$ true ☑ false ☐

2. **Predicates** [12 points]

Suppose three predicates, C, D and O (standing for being a cat, a dog, or the name of an operating system) are defined over the universe {Lion, Wolf, Fox, Puma, Jaguar}, as follows (T denotes True and F denotes False).

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Select all the statements below that are true. (No justification is needed.)

☑ A. $\exists x\ D(x) \rightarrow O(x)$. consider x s.t. $\neg D(x)$: say $x =$ Lion.

☑ B. $\forall x\ O(x) \rightarrow C(x)$. Since C(Lion) and C(Jaguar).

☐ C. $\exists x\ \neg(O(x) \rightarrow C(x))$. This is the negation of A.

☑ D. $\forall x\ \neg(C(x) \wedge D(x))$. C and D are never simultaneously true.

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☐ A. $p \rightarrow F$ (where F stands for false)

☐ B. $p \rightarrow \neg p$

☑ C. $\neg p \rightarrow p$