CS 173, Fall 2014, Examlet 1, Part A Solutions

NAME:	NETID:

Discussion: Th 2 Th 3 Th 4 Th 5 Fr 9 Fr 10 Fr 11 Fr 12 Fr 1 Fr 2

State the negation and the contrapositive of the following claim, moving all negations (e.g. "not") so that they are on individual predicates.

Claim: For every dinosaur d, if d is huge, then d is an adult and d is a sauropod.

1. (5 points) Negation

   Solution: There exists a huge dinosaur d that is either not an adult or not a sauropod.

2. (5 points) Contrapositive

   Solution: For every dinosaur d, if d is not an adult or d is not a sauropod, then d is not huge.

3. (5 points) Suppose that F and G are functions whose inputs and outputs are real numbers, defined by $F(x) = x^2 + 14x$ and $G(x) = \sqrt{x + 49}$. Compute the value of $G(F(p))$. Simplify your answer and show your work.

   Solution: $G(F(p)) = G(p^2 + 14p) = \sqrt{(p^2 + 14p) + 49} = \sqrt{(p + 7)^2} = |p + 7|$

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State the negation and the contrapositive of the following claim, moving all negations (e.g. "not") so that they are on individual predicates.

Claim: For every cat c, if c is not fierce or c wears a collar, then c is a pet.

1. (5 points) Negation

   Solution: There exists a cat c that is either not fierce or wears a collar and is not a pet.

2. (5 points) Contrapositive

   Solution: For every cat c, if c is not a pet, then c is fierce and c does not wear a collar.

3. (5 points) Solve $5x + m = \frac{n}{5}$ for x, expressing your answer as a single fraction. Show your work.

Solution:

$$\begin{aligned} 5x + m &= \frac{n}{5} \\ 5x &= \frac{n}{5} - m \\ x &= \frac{n}{25} - \frac{m}{5} = \frac{n - 5m}{25} \end{aligned}$$

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State the negation and the contrapositive of the following claim, moving all negations (e.g. "not") so that they are on individual predicates.

Claim: For every tiger k, if k is orange, then k is large or k is not friendly.

1. (5 points) Negation

   Solution: There exists an orange tiger k that is not large and is friendly.

2. (5 points) Contrapositive

   Solution: For every tiger k, if k is not large and k is friendly, then k is not orange.

3. (5 points) Suppose that k is a positive integer, x is a positive real number, and $\frac{1}{k} = x + \frac{1}{6}$. What are the possible values for k? (Hint: k is an INTEGER.) Briefly explain or show work.

Solution: Observe that we can rearrange the equation as follows:

Since x is positive, $\frac{1}{k} = x + \frac{1}{6}$ implies that $\frac{1}{k} > \frac{1}{6}$. So k must be smaller than 6. But we were told that k was a positive integer. The only positive integers smaller than 6 are 1, 2, 3, 4, and 5.