CS 173, Fall 18 Examlet 1, Part A

Name:_____

NetID:_____ **Lecture: B**

Discussion: Friday 11 12 1 2 3 4

1. (5 points) State the contrapositive of the following claim, moving all negations (e.g. "not") so that they are on individual predicates.

For every tree t, if t grows in Canada, then t is not tall or t is a conifer.

Solution: For every tree t, if g is tall and t is not a conifer, then t doesn't grow in Canada.

2. (5 points) State the negation of the following claim, moving all negations (e.g. "not") so that they are on individual predicates.

For every computer game g, if g has trendy music or g has an interesting plotline, then g is not cheap.

Solution: There is a computer game g such that g has trendy music or an interesting plotline but g is cheap.

3. (5 points) Suppose that G and H are functions whose inputs and outputs are real numbers, defined by $G(x) = x - 5$ and $H(x) = \sqrt{x+1}$. Compute the value of $H(H(G(13)))$, showing your work.

Solution: $G(13) = 8$. So $H(G(13)) = \sqrt{9} = 3$. So $H(H(G(13))) = \sqrt{4} = 2$.

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1. (5 points) Show that the following two expressions are not logically equivalent, by giving specific values of p, q, and r for which they produce different values.

$(p \to q) \wedge r$

$p \to (q \wedge r)$

Solution: Set p and r to be false and q to be true. Then $(p \to q)$ is true (because its hypothesis is false) and $(p \to q) \wedge r$. But $p \to (q \wedge r)$ is true because its hypothesis is false.

2. (5 points) State the contrapositive of the following claim, moving all negations (e.g. "not") so that they are on individual predicates.

For every dinosaur d, if d is small and d is not a juvenile, then d is not a sauropod.

Solution: For every dinosaur d, if d is a sauropod, then d is not small or d is a juvenile.

3. (5 points) Suppose that F and G are functions whose inputs and outputs are positive 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: Solution: Notice that p is given to be positive, so $p + 7$ is also positive.

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