# CS 173, Spring 2016
# Examlet 1, Part A

**NETID:**

**FIRST:**

**LAST:**

**Discussion: Monday 9 10 11 12 1 2 3 4 5**

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

There is a soup $s$ such that $s$ is tasty and $s$ does not contain meat.

**Solution:** For every soup $s$, $s$ is not tasty or $s$ contains meat.

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 jedi $j$, if $j$ has a light saber and $j$ is not sick, then $j$ can defeat the Dark Side.

**Solution:** For every jedi $j$, if $j$ cannot defeat the Dark Side. then $j$ does not have a light saber or $j$ is sick.

3. (5 points) Find all integer solutions to the equation $2p^2 + 5p = 3$. Show your work.

**Solution:** Since $2p^2+5p = 3$, $2p^2+5p-3 = 0$. Factoring the lefthand side, we get $(p-\frac{1}{2})(2p+6) = 0$. So $p$ must be either $\frac{1}{2}$ or -3. But $\frac{1}{2}$ is not an integer. So $p = -3$.

# CS 173, Spring 2016
# Examlet 1, Part A

**NETID:**

**FIRST:** | **LAST:**

**Discussion: Monday 9 10 11 12 1 2 3 4 5**

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 dog $d$, if $d$ is a terrier, then $d$ is not large and $d$ is noisy.

**Solution:** For every dog $d$, if $d$ is large or $d$ is not noisy, then $d$ is not a terrier.

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 mountain $m$, if $m$ is tall or $m$ is not in the north, then $m$ has a snow cap.

**Solution:** There is a mountain $m$, such that $m$ is tall or $m$ is not in the north, but $m$ does not have a snow cap.

3. (5 points) Find all integer solutions to $x^2 - 2x - 3 < 0$. Show your work.

**Solution:** Factoring the lefthand side, we get $(x + 1)(x - 3) < 0$. Since $x + 1$ is larger than $x - 3$, this means that $x + 1 > 0$ and $x - 3 < 0$. So $x > -1$ and $x < 3$. The only integers in this range are 0, 1, and 2.

# CS 173, Spring 2016
# Examlet 1, Part A

| NETID: | |
|---|---|

| FIRST: | LAST: |
|---|---|

**Discussion: Monday 9 10 11 12 1 2 3 4 5**

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 mountain $m$, if $m$ is tall or $m$ is not in the north, then $m$ has a snow cap.

**Solution:** For every mountain $m$, if $m$ does not have a snow cap, then $m$ is not tall andr $m$ is in the north.

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

There is a mushroom $f$ such that $f$ is not poisonous or $f$ is blue.

**Solution:** For every mushroom $f$, $f$ is poisonous and $f$ is not blue.

3. (5 points) Suppose that $G$ and $H$ are functions whose inputs and outputs are real numbers, defined by $G(x) = x - 2$ and $H(x) = \sqrt{2x + 1}$, where the square root function returns only the positive root. Compute the value of $H(G(G(8)))$, showing your work.

**Solution:** $G(8) = 6$

So $G(G(8)) = 4$

So $H(G(G(8))) = \sqrt{2 \cdot 4 + 1} = \sqrt{9} = 3$

# CS 173, Spring 2016
# Examlet 1, Part A

**NETID:**

**FIRST:**

**LAST:**

**Discussion: Monday 9 10 11 12 1 2 3 4 5**

1. (5 points) Give a truth table for the following expression and (using your truth table or other means) find a simpler expression equivalent to it.

**Solution:**

$(r \to q) \to r = r$

| q | r | $r \to q$ | $(r \to q) \to r$ |
|---|---|---|---|
| T | T | T | T |
| T | F | T | F |
| F | T | F | T |
| F | F | T | F |

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 egg $E$, if $E$ floats, then $E$ is not good or the water has been salted.

**Solution:** For every egg $E$, if $E$ is good and the water has not been salted, then $E$ will not floats.

3. (5 points) Solve $\frac{3}{7x} + a = \frac{b}{7}$ for $x$, expressing your answer as a single fraction. Show your work.

**Solution:** Multiplying everything by $7x$, we get $3 + 7ax = bx$.

So then $bx - 7ax = 3$. So $x(b - 7a) = 3$. So $x = \frac{3}{b-7a}$.

# CS 173, Spring 2016
# Examlet 1, Part A

**NETID:**

**FIRST:**

**LAST:**

**Discussion: Monday 9 10 11 12 1 2 3 4 5**

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

For every jedi $j$, if $j$ has a light saber and $j$ is not sick, then $j$ can defeat the Dark Side.

**Solution:** There is a jedi $j$, such that $j$ has a light saber and $j$ is not sick, but $j$ cannot defeat the Dark Side.

2. (5 points) Solve $\dfrac{2m^2 - m - 6}{m - 2} = 9$ for $m$.

**Solution:** Notice that $2m^2 - m - 6 = (m - 2)(2m + 3)$. So $\dfrac{2m^2 - m - 6}{m - 2} = 2m + 3$.

So our problem reduces to solving $2m + 3 = 9$. That is, $2m = 6$. So $m = 3$.

3. (5 points) Give a truth table for the following expression and (using your truth table or other means) find a simpler expression equivalent to it.

**Solution:**

$(p \to q) \wedge (p \to \neg q) = \neg p$

| p | q | $p \to q$ | $p \to \neg q$ | $(p \to q) \wedge (p \to \neg q)$ |
|---|---|---|---|---|
| T | T | T | F | F |
| T | F | F | T | F |
| F | T | T | T | T |
| F | F | T | T | T |