CS 173, Fall 2015
Examlet 2, Part A

NETID:

FIRST: **LAST:**

Discussion: Thursday 2 3 4 5 Friday 9 10 11 12 1 2

Recall that a real number p is rational if there are integers m and n (n non-zero) such that $p = \frac{m}{n}$. Use this definition and your best mathematical style to prove the following claim by contrapositive.

> For all real numbers x and y, if x is not rational, then $2x + 3y$ is not rational or y is not rational.

You must begin by explicitly stating the contrapositive of the claim:

CS 173, Fall 2015
Examlet 2, Part A

NETID:

FIRST: **LAST:**

Discussion: Thursday 2 3 4 5 Friday 9 10 11 12 1 2

Prove the following claim, using your best mathematical style and the following definition of congruence mod k: $a \equiv b \pmod{k}$ if and only if $a = b + nk$ for some integer n.

Claim: For all integers a, b, c, d, and k (k positive), if $a \equiv b \pmod{k}$ and $c \equiv d \pmod{k}$ then $a^2 + c \equiv b^2 + d \pmod{k}$.

CS 173, Fall 2015
Examlet 2, Part A

NETID:

FIRST: **LAST:**

Discussion: Thursday 2 3 4 5 Friday 9 10 11 12 1 2

Prove the following claim, using your best mathematical style and the following definition of congruence mod k: $a \equiv b \pmod{k}$ if and only if $a = b + nk$ for some integer n.

Claim: For all integers a, b, c, p, q where p and q are positive, if $a \equiv 2b+1 \pmod{p}$ and $c \equiv b \pmod{q}$ and $q \mid p$, then $a - 2c \equiv 1 \pmod{q}$.

CS 173, Fall 2015
Examlet 2, Part A

NETID:

FIRST:	**LAST:**

Discussion: Thursday 2 3 4 5 Friday 9 10 11 12 1 2

Prove the following claim, using your best mathematical style. Hint: look at remainders and use proof by cases.

Prove that if n is an integer, then $n^2 + 2$ is not divisible by 4.

CS 173, Fall 2015
Examlet 2, Part A

NETID:	

FIRST:	**LAST:**

Discussion: Thursday 2 3 4 5 Friday 9 10 11 12 1 2

Use proof by contrapositive to prove the following claim, using your best mathematical style and working directly from the definitions of "odd" and "even." (You may assume that odd and even are opposites.)

For all real numbers x and y, if $3x + y^2 + 2$ is odd, then x is even or y is even.

You must begin by explicitly stating the contrapositive of the claim:

CS 173, Fall 2015
Examlet 2, Part A

NETID:

FIRST: **LAST:**

Discussion: Thursday 2 3 4 5 Friday 9 10 11 12 1 2

Prove the following claim, working directly from the definitions of “remainder” and “divides”, and using your best mathematical style.

For all real numbers k, m, n and r, if $r = \text{remainder}(m, n)$, $k \mid m$, and $k \mid n$, then $k \mid r$.