CS 173, Fall 2016
Examlet 3, Part A

NETID:

FIRST: | **LAST:**

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

$A = \{\alpha(2, -4) + (1 - \alpha)(-2, 5)) \mid \alpha \in \mathbb{R}\}$

$B = \{(a, b) \in \mathbb{R}^2 \mid b \leq -1\}$

$C = \{(p, q) \in \mathbb{R}^2 \mid p \geq 0\}$

Prove that $A \cap B \subseteq C$.

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$A = \{(x, y) \in \mathbb{R}^2 \mid x^2 + y^2 + 4y + 4 \leq 100\}$

$B = \{(p, q) \in \mathbb{R}^2 \mid p \leq -6\}$

$C = \{(a, b) \in \mathbb{R}^2 \mid b \leq 7\}$

Prove that $A \cap B \subseteq C$.

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$A = \{(a, b) \in \mathbb{R}^2 \ : \ a = 3 - b^2\}$

$B = \{(x, y) \in \mathbb{R}^2 \ : \ |x| \geq 1 \text{ or } |y| \geq 1\}$

Prove that A $\subseteq$ B. Hint: you may find proof by cases helpful.

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For any integers s and t define $L(s,t)$ as follows:

$$L(s,t) = \{sx + ty \mid x, y \in \mathbb{Z}\}$$

Thus, $L(s,t)$ consists of all integers that can be expressed as the sum of multiples of s and t. Prove the following claim using your best mathematical style and the following definition of congruence mod k: $p \equiv q \pmod{k}$ if and only if $p = q + kn$ for some integer n.

Claim: For any integers a, b, r, where r is positive, if $a \equiv b \pmod{r}$, then $L(a,b) \subseteq L(r,b)$.

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$A = \{(a, b) \in \mathbb{R}^2 \ : \ b = a^2 - 2\}$

$B = \{(x, y) \in \mathbb{R}^2 \ : \ \lfloor x \rfloor = 4\}$

$C = \{(p, q) \in \mathbb{R}^2 \ : \ 2p \leq q\}$

Prove that $A \cap B \subseteq$ C.

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$A = \{\lambda(0,3) + (1-\lambda)(2,4) \ | \ \lambda \in [0,1]\}$

$B = \{(x,y) \in \mathbb{R}^2 \ | \ x \leq y\}$

Prove that $A \subseteq B$.