Name:____

NetID:________________________ **Lecture:** **A** **B**

Discussion: **Thursday** **Friday** **9** **10** **11** **12** **1** **2** **3** **4** **5** **6**

$A = \{(x, y) \in \mathbb{R}^2 \ : \ y = x^2 - 4\}$

$B = \{(p, q) \in \mathbb{Z}^2 \ : q < 0\}$

$C = \{(a, b) \in \mathbb{R}^2 \ : \ |a| \leq 1\}$

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

Name:____

NetID:________________________ **Lecture:** **A** **B**

Discussion: **Thursday** **Friday** **9** **10** **11** **12** **1** **2** **3** **4** **5** **6**

$A = \{(x, y, z) \in \mathbb{R}^3 \mid 0 < x < y - 1\}$

$B = \{(a, b, c) \in \mathbb{R}^3 \mid b^2 + 2 < c^2\}$

$C = \{(p, q, r) \in \mathbb{R}^3 \mid p^2 < r^2\}$

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

Name:____

NetID:________________________ **Lecture:** **A** **B**

Discussion: **Thursday** **Friday** **9** **10** **11** **12** **1** **2** **3** **4** **5** **6**

$A = \{\alpha(2, -4) + (1 - \alpha)(-3, 6)) \ \mid \ \alpha \in \mathbb{R}\}$

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

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

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

Name:____

NetID:____________________ **Lecture:** **A** **B**

Discussion: **Thursday** **Friday** **9** **10** **11** **12** **1** **2** **3** **4** **5** **6**

$A = \{(x, y) \in \mathbb{R}^2 \ : \ y = x^2 - 2x - 1\}$

$B = \{(p, q) \in \mathbb{R}^2 \ : \ |p| \geq 3\}$

$C = \{(m, n) \in \mathbb{R}^2 \ : \ n \geq 0\}$

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

Name:____

NetID:________________________ **Lecture:** **A** **B**

Discussion: **Thursday** **Friday** **9** **10** **11** **12** **1** **2** **3** **4** **5** **6**

$A = \{(x, y, z) \in \mathbb{R}^3 \ : y = x^2 - 2x + 11\}$

$B = \{(a, b, c) \in \mathbb{R}^3 \ : \ b \leq c\}$

$C = \{(p, q, r) \in \mathbb{R}^3 \ : \ r \geq 5\}$

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

Name:____

NetID:________________________ **Lecture: A B**

Discussion: Thursday Friday 9 10 11 12 1 2 3 4 5 6

$A = \{(x, y, z) \in \mathbb{R}^3 \ : \ |x + y + z| = 20\}$

$B = \{(a, b, c) \in \mathbb{N}^3 \ : \ a + b < 5\}$

$C = \{(p, q, r) \in \mathbb{R}^3 \ : \ r > 10\}$

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

Name:____

NetID:____________________ **Lecture:** **A** **B**

Discussion: **Thursday** **Friday** **9** **10** **11** **12** **1** **2** **3** **4** **5** **6**

$A = \{(x, y) \in \mathbb{R}^2 \ : \ xy \leq -7\}$

$B = \{(p^3, p^2) \ : \ p \in \mathbb{R}\}$

$C = \{(a, b) \in \mathbb{R}^2 \ : \ a < 0\}$

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

Name:____

NetID:________________________ **Lecture: A B**

Discussion: Thursday Friday 9 10 11 12 1 2 3 4 5 6

$A = \{a(1,0) + b(3,1) + c(2,4) \ : \ a, b, c \text{ are positive reals and } a + b + c = 1\}$

$B = \{(x, y) \in \mathbb{R}^2 \ : \ x \leq 3 \text{ and } y \geq 0\}$

Prove that $A \subseteq B$.

Name:____

NetID:________________________ **Lecture:** **B**

Discussion: **Thursday** **Friday** **11** **12** **1** **2** **3** **4**

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

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

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

CS 173, Fall 18 Examlet 3, Part A

Name:____

NetID:________________________ **Lecture:** **B**

Discussion: **Thursday** **Friday** **11** **12** **1** **2** **3** **4**

$A = \{(x, y) \in \mathbb{Z}^2 \mid 2xy + 6y - 5x - 15 \geq 0\}$

$B = \{(a, b) \in \mathbb{Z}^2 \mid a \geq 0\}$

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

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

Name:____

NetID:________________________ **Lecture:** **A** **B**

Discussion: **Thursday** **Friday** **9** **10** **11** **12** **1** **2** **3** **4** **5** **6**

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 $L(a,b) \subseteq L(r,b)$.

Name:____

NetID:____________________ **Lecture:** **A** **B**

Discussion: **Thursday** **Friday** **9** **10** **11** **12** **1** **2** **3** **4** **5** **6**

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

$B = \{(x, y) \in \mathbb{R}^2 \mid (x-1)^2 + y^2 = 4\}$

$C = \{(s, t) \in \mathbb{R}^2 \mid (s+1)^2 + t^2 = 4\}$

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

Name:____

NetID:____________________ **Lecture:** **A** **B**

Discussion: **Thursday** **Friday** **9** **10** **11** **12** **1** **2** **3** **4** **5** **6**

$A = \{(x, y, z) \in \mathbb{Z}^3 \ : \ 2x + y = z - 1\}$

$B = \{(a, b, c) \in \mathbb{Z}^3 \ : \ 2a - b = c - 3\}$

$C = \{(p, q, r) \in \mathbb{Z}^3 \ : \ r \text{ is even}\}$

Prove that $A \cap B \subseteq C$. (Work directly from the definition of "even.")

CS 173, Spring 18 Examlet 3, Part A

Name:____

NetID:____________________ **Lecture:** **A** **B**

Discussion: **Thursday** **Friday** **9** **10** **11** **12** **1** **2** **3** **4** **5** **6**

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

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

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

Name:____

NetID:________________________ **Lecture:** **A** **B**

Discussion: **Thursday** **Friday** **9** **10** **11** **12** **1** **2** **3** **4** **5** **6**

$A = \{\lambda(3,2) + (1-\lambda)(5,0) \ \mid \ \lambda \in [0,1]\}$

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

Prove that $A \subseteq B$.

Name:____

NetID:______________________ **Lecture:** **A** **B**

Discussion: **Thursday** **Friday** **9** **10** **11** **12** **1** **2** **3** **4** **5** **6**

$A = \{(x, y, z) \in \mathbb{Z}^3 \ : \ 0 < x \le y \le z\}$

$B = \{(a, b, c) \in \mathbb{R}^3 \ : \ c^2 \le a\}$

$C = \{(p, q, r) \in \mathbb{R}^3 \ : \ p \ge 1\}$

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

Name:____

NetID:____________________ **Lecture:** **A** **B**

Discussion: **Thursday** **Friday** **9** **10** **11** **12** **1** **2** **3** **4** **5** **6**

$A = \{(x, y, z) \in \mathbb{R}^3 \mid 0 < x < y - 1\}$

$B = \{(a, b, c) \in \mathbb{R}^3 \mid b^2 + 2 < c^2\}$

$C = \{(p, q, r) \in \mathbb{R}^3 \mid p^2 < r^2\}$

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

Name:____

NetID:____________________ **Lecture:** **A** **B**

Discussion: **Thursday** **Friday** **9** **10** **11** **12** **1** **2** **3** **4** **5** **6**

$A = \{(x,y) \in \mathbb{R}^2 \mid x = \lfloor 3y + 5 \rfloor\}$

$B = \{(p,q) \in \mathbb{Z}^2 \mid 2p + q \equiv 3 \pmod{7}\}$

Prove that $A \cap \mathbb{Z}^2 \subseteq B$.

Use the following definition of congruence mod k: if s, t, k are integers, k positive, then $s \equiv t \pmod{k}$ if and only if $s = t + nk$ for some integer n.

Name:____

NetID:________________________ **Lecture:** **A** **B**

Discussion: **Thursday** **Friday** **9** **10** **11** **12** **1** **2** **3** **4** **5** **6**

$A = \{(x,y) \in \mathbb{R}^2 \mid y = x^2 - 3x + 2\}$

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

$C = \{(m,n) \in \mathbb{R}^2 \mid n \geq 1\}$

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

CS 173, Fall 17 **Examlet 3, Part A**

Name:____

NetID:____________________ **Lecture:** **A** **B**

Discussion: **Thursday** **Friday** **9** **10** **11** **12** **1** **2** **3** **4** **5** **6**

$A = \{(x, y) \in \mathbb{R}^2 \ : \ |x + y + 2| < 5\}$

$B = \{(p, q) \in \mathbb{R}^2 \ : \ |p - q| < 3\}$

$C = \{(a, b) \in \mathbb{R}^2 \ : \ |ab| < 10\}$

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

Name:____

NetID:____________________ **Lecture:** **A** **B**

Discussion: **Thursday** **Friday** **9** **10** **11** **12** **1** **2** **3** **4** **5** **6**

$A = \{(x, y) \in \mathbb{Z}^2 \mid 2xy + 6y - 5x - 15 \geq 0\}$

$B = \{(a, b) \in \mathbb{Z}^2 \mid a \geq 0\}$

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

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

Name:____

NetID:________________________ **Lecture:** **A** **B**

Discussion: **Thursday** **Friday** **9** **10** **11** **12** **1** **2** **3** **4** **5** **6**

$A = \{(x, y, z) \in \mathbb{R}^3 \ : \ |x + y + z| = 20\}$

$B = \{(a, b, c) \in \mathbb{N}^3 \ : \ a + b < 5\}$

$C = \{(p, q, r) \in \mathbb{R}^3 \ : \ r > 10\}$

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

Name:____

NetID:____________________ **Lecture: A B**

Discussion: Thursday Friday 10 11 12 1 2 3 4 5 6

$A = \{(x, y) \in \mathbb{R}^2 \ : \ y = x^2 - 4\}$

$B = \{(p, q) \in \mathbb{Z}^2 \ : q < 0\}$

$C = \{(a, b) \in \mathbb{R}^2 \ : \ |a| \leq 1\}$

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

Name:____

NetID:______________________ **Lecture:** **A** **B**

Discussion: **Thursday** **Friday** **10** **11** **12** **1** **2** **3** **4** **5** **6**

$A = \{(x, y) \in \mathbb{Z}^2 \mid 2xy + 6y - 5x - 15 \geq 0\}$

$B = \{(a, b) \in \mathbb{Z}^2 \mid a \geq 0\}$

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

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

Name:____

NetID:________________________ **Lecture:** **A** **B**

Discussion: **Thursday** **Friday** **10** **11** **12** **1** **2** **3** **4** **5** **6**

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

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

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

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

Name:____

NetID:____________________ **Lecture:** **A** **B**

Discussion: **Thursday** **Friday** **10** **11** **12** **1** **2** **3** **4** **5** **6**

$A = \{a(1,0) + b(3,1) + c(2,4) \ : \ a, b, c \text{ are positive reals and } a + b + c = 1\}$

$B = \{(x, y) \in \mathbb{R}^2 \ : \ x \leq 3 \text{ and } y \geq 0\}$

Prove that $A \subseteq B$.

Name:____

NetID:______________________ **Lecture:** **A** **B**

Discussion: **Thursday** **Friday** **10** **11** **12** **1** **2** **3** **4** **5** **6**

$A = \{(x, y) \in \mathbb{R}^2 \ : \ xy \leq -7\}$

$B = \{(p^3, p^2) : p \in \mathbb{R}\}$

$C = \{(a, b) \in \mathbb{R}^2 \ : \ a < 0\}$

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

Name:____

NetID:________________________ **Lecture:** **A** **B**

Discussion: **Thursday** **Friday** **10** **11** **12** **1** **2** **3** **4** **5** **6**

$A = \{(x, y) \in \mathbb{R}^2 \ : \ y = x^2 - 4\}$

$B = \{(p, q) \in \mathbb{Z}^2 \ : q < 0\}$

$C = \{(a, b) \in \mathbb{R}^2 \ : \ |a| \leq 1\}$

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