Homework #3

Due **Friday, September 12** in Gradescope by **11:59 pm ET**

READ Sections 1.2, 1.3 in Richmond&Richmond, and start 1.4

WATCH Video 3: A Partition Proof (20:54) [Found on moodle site]

WRITE AND SUBMIT solutions to the following problems. **ALWAYS** justify your claims.

Problem 1. (12 points) Section 1.2, #15
For any sets A, B, C, prove that $A \times (B \cap C) = (A \times B) \cap (A \times C)$.

Problem 2. (6 points) Section 1.2, #20
At a diner, the special consists of your choice of meatloaf or chicken as an entree, served with mashed potatoes and your choice of one vegetable from seven on the menu and one dessert from five on the menu. How many ways can you place an order for the special?

(*Note*: Please approach this problem by considering the set of possible orders as $E \times V \times D$, where E is the set of entrees, V is the set of vegetables, and D is the set of desserts.)

Problem 3. (15 points) Section 1.3, #6
For each $m \in \mathbb{N}$, let $C_m = \{x \in \mathbb{R} \mid m - 1 \leq x^2 < m\}$. Let $\mathcal{C} = \{C_m \mid m \in \mathbb{N}\}$.
Is $\mathcal{C}$ a partition of $\mathbb{R}$? Answer yes or no, and then prove your answer.

Problem 4. (15 points) Section 1.3, #9(a)
For each $b \in \mathbb{R}$, let $I_b = \{(x, y) \in \mathbb{R}^2 \mid y = b\}$. Let $\mathcal{C} = \{I_b \mid b \in \mathbb{R}\}$. Is $\mathcal{C}$ a partition of $\mathbb{R} \times \mathbb{R}$? Answer yes or no, and then prove your answer.

Problem 5. (12 points) Section 1.4, Problem 1(a,c,e,f)
Consider the following statements:

S = Susan studies
G = Susan gets good grades
H = Susan gets help when needed

Write the following sentences symbolically:

(a) Susan studies but does not get good grades.
(c) It is not true that Susan studies and gets good grades.
(e) Susan studies or does not study, and she gets good grades.
(f) Susan studies, gets help when needed, and gets good grades.

Problem 6. (12 points) Section 1.4, #2(b,c,e,g)
Consider the following statements:

P = Presidential candidates must be 35 years of age or older
Q = Presidential candidates must be citizens of the United States
R = Presidential candidates must have \$27 million

Write the following statements in words (as complete English sentences):

(b) $P \wedge Q$
(c) $Q \vee R$
(e) $(P \wedge Q) \vee R$
(g) $P \wedge (\sim R)$

(Office Hour Information on next page)

Questions? You can ask in class or in:

My (Drop-In) Office Hours (SMUD 406):

Mondays	2:00–3:30pm
Tuesdays	1:45–3:15pm
Fridays	1:00–2:00pm

or by appointment.

Allison Tanguay's QCenter Drop-in Hours (SMUD 208):

Mon/Wed/Fri	10:00am–noon
Tue/Thu	1:30–4:30pm

Math Fellow Drop-in Hours (SMUD 006):

Mondays	6:00–7:30pm	**Aaron** Cordoba
Mondays	7:30–9:00pm	**John** Lim
Tuesdays	6:00–7:30pm	**Aaron** Cordoba
Tuesdays	7:30–9:00pm	**Gretta** Ineza
Wednesdays	7:30–9:00pm	**John** Lim
Thursdays	6:00–7:30pm	**Gretta** Ineza

Also, you may email me any time at `rlbenedetto@amherst.edu`