Homework #2
Due ~~Tuesday, September 9~~ **Wednesday, September 10** in Gradescope by **11:59 pm ET**

READ | Sections 1.1, 1.2 in Richmond&Richmond |

WATCH | Video 2: A Union Proof | (19:37)   [Found on moodle site]

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

Problem 1. (4 points) Section 1.1, #2
Which has the larger cardinality? The set of letters in the word <u>MISSISSIPPI</u> or the set of letters in the word <u>FLORIDA</u>?

Problem 2. (24 points) Section 1.1, #10(b(iv–ix))
For each $k \in \{1, 2, \ldots, 20\}$, let $D_k = \{x \mid x \text{ is a prime number that divides } k\}$.
Let $\mathcal{D} = \{D_k \mid k = 1, 2, \ldots, 20\}$. True or false (and briefly justify):

    (iv) $\varnothing \in \mathcal{D}$ (v) $\varnothing \subsetneq \mathcal{D}$ (vi) $5 \in \mathcal{D}$

    (vii) $\{5\} \in \mathcal{D}$ (viii) $\{4, 5\} \in \mathcal{D}$ (ix) $\{\{3\}\} \subseteq \mathcal{D}$

Problem 3. (18 points) Section 1.2, #4(a,b,d,h,m,n)
Let U be the set of 52 cards in a standard deck. Let S, D, A, K be the sets of spades, diamonds, aces, and kings, respectively. Say which cards belong to each set below, and find the cardinality of each set. (And briefly justify.)

    (a) $A \cap D$ (b) $S \cap D$ (d) $(A \cup K) \cap (S \cup D)$

    (h) $K \cap [(S \cup D)^c]$ (m) $S \smallsetminus K$ (n) $K \smallsetminus S$

Problem 4. (6 points) Section 1.2, #7(b), first two parts
Determine whether the sets in this collection are mutually disjoint. Also determine whether the collection is nested. (And of course, briefly justify everything!)
$$\mathcal{B} = \left\{ \left(-\tfrac{1}{n}, n\right) \mid n \in \mathbb{N} \right\}$$

Problem 5. (16 points) Section 1.2, #7(b), last two parts
Find the union of the sets in the collection $\mathcal{B}$ above. Also find the intersection of the sets in $\mathcal{B}$.
In both cases, say what the set is and also **prove** the equality of sets you are claiming.

Problem 6. (8 points) Section 1.2, #8(d,e)
Determine whether the following statements are true or false, and briefly justify.

    (d): $\mathcal{B} \subseteq \mathcal{A}$, where $\mathcal{B}$ is as in the previous problem, and $\mathcal{A} = \left\{ \left(\tfrac{1}{n}, n+1\right) \mid n \in \mathbb{N} \right\}$

    (e): $\mathcal{C} \subseteq \mathcal{D}$, where $\mathcal{C} = \left\{ (n, \infty) \mid n \in \mathbb{N} \right\}$ and $\mathcal{D} = \left\{ (x, \infty) \mid x \in \mathbb{R} \right\}$

(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`