21-241 Lec3 **Groupwork 6** **February 21, 2017**

Answer the questions below. You may answer in the space provided. You may use a separate sheet of paper if you need more space. You are to work in groups of no more than four people. Make sure to enter the names of your groupmates below.

Name: _____

Section: _____

Group Members: _____

1. (5 points) Let S_i be a subspace of $\mathbb{R}^n$ for each $i \in I$ where I is an arbitrary (possibly infinite) index set. Show that $\bigcap_{i \in I} S_i$ is also a subspace of $\mathbb{R}^n$. That is, intersections of subspaces are subspaces.

2. (5 points) Give an example of two subspaces of $\mathbb{R}^2$, S_1 and S_2, such that $S_1 \cup S_2$ is NOT a subspace of $\mathbb{R}^2$ (and show the union of these two subspaces is not a subspace). Thus, unions of subspaces need not be subspaces themselves.

3. (10 points) The matrix

$$A = \begin{bmatrix} 3 & 5 \\ -9 & -15 \end{bmatrix}$$

is not invertible (you can verify this with your calculator if you wish). Find a $\mathbf{b}$ such that $A\mathbf{x} = \mathbf{b}$ has no solution and find an $\mathbf{x}_0 \neq \mathbf{0}$ such that $A\mathbf{x}_0 = \mathbf{0}$.