

# Homework 3: Graphs and Geometry III

Konstantin Miagkov

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**Problem 1.**

a) Let  $AM$  be the median of  $\triangle ABC$ . Show that if  $AM = BM = CM$ , then  $\angle BAC = 90^\circ$

b) Show the converse: if  $\angle BAC = 90^\circ$ , then  $AM = BM = CM$  where  $AM$  is the median.

**Problem 2.**

In a group, every two people have exactly 7 common friends. Show that the number of total friendships is divisible by 3.

**Problem 3.**

Every point on the plane is colored in either red or blue. Show that there exists a segment of length 1 whose endpoints have the same color.