

# Homework 6

1. Give 4 examples of implications, and for each write down their contrapositive. Have two be real-world examples, and two be math examples.

Also, if you can, try to have at least one of your “real world” examples be from a song or a movie or a tv show or some other form of entertainment. As an example from last semester, “If a guy is a scrub, then he can’t get no love from me.” Contrapositive: “If a guy can get love from me, then he is not a scrub.”

2. (a) What is the contrapositive of “If  $n^2 - 4n + 7$  is even, then  $n$  is odd”?  
 (b) Suppose that  $n \in \mathbb{Z}$ . Prove that if  $n^2 - 4n + 7$  is even, then  $n$  is odd.
3. (a) What is the contrapositive of “If  $mn$  is odd, then  $m$  is odd and  $n$  is odd”?  
 (b) Suppose that  $m, n \in \mathbb{Z}$ . Prove that if  $mn$  is odd, then  $m$  is odd and  $n$  is odd.
4. Suppose  $x, y \in \mathbb{R}$ . Prove that if  $x + y \geq 2$ , then  $x \geq 1$  or  $y \geq 1$ .
5. Suppose  $n \in \mathbb{Z}$ . Prove that  $n$  is even if and only if  $n^2 + 1$  is odd.  
 Note: One way to prove  $P \Leftrightarrow Q$  is to prove  $P \Rightarrow Q$  and then  $Q \Rightarrow P$ .

