

**Instructions:** You are being given an opportunity to earn back up to 15 points on Exam 1 by completing the following problems. These additional problems are due at the beginning of class on Friday, Sept. 18th. You must work on these problems by yourself (i.e. without any outside help).

1. (7 points) Use a 2-column proof to show that the proposition  $[\neg p \wedge (p \vee q)] \rightarrow q$  is a tautology.

2. (8 points) Let  $a$  and  $b$  be positive real numbers. Use proof by contradiction to show that  $\frac{a+b}{2} \geq \sqrt{ab}$ .  
[Hint - Prove the Lemma: If  $a > b \geq 0$ , then  $a^2 > b^2$ ].