Math 301
Quiz 7

Show all work in a neat and organized fashion. Clearly indicate your answers.
10 points possible.

1. (3 pts.) Write the contrapositive of the following statement.

For all positive real numbers p and q, if $p = q$, then $\sqrt{pq} = (p + q)/2$.

2. (4 pts.) A poker hand consists of 5 cards chosen from a standard deck of 52 cards. A hand is called "two pairs" provided it contains two sets of pairs of different rank (numerical value), with the fifth card having different rank from either of the pairs.

How many "two pairs" are there?

3. (3 pts.) There are exactly two possible equivalence relations on a two-element set: If $A = \{1, 2\}$, then $R_1 = \{(1, 1), (2, 2)\}$ and $R_2 = \{(1, 1), (1, 2), (2, 1), (2, 2)\}$ are the only equivalence realtions on A.

There are fifteen different equivalence relations on the set $A = \{1, 2, 3, 4\}$. You will be asked to list all of them.

Note: One of them is

$$R = \{(1, 1), (1, 2), (2, 1), (2, 2), (3, 3), (3, 4), (4, 3), (4, 4)\}.$$

It would be painful to write out all of them like this. However, for short, we could just write the equivalence classes.

What are the equivalence classes for this R? Devise a convenient shorthand notation for your answer.

Now, using your shorthand notation, list all fifteen different equivalence relations on $A = \{1, 2, 3, 4\}$.